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(54) METHOD FOR CLOSING AUTOMATICALLY AN AXIAL END OF A TUBULAR MANUFACTURE AND FOR UNLOADING IT IN AN INSIDE-OUT CONFIGURATION, AND APPARATUS FOR PERFORMING THE METHOD

VERFAHREN UND VORRICHTUNG ZUM AUTOMATISCHEN VERSCHLUSS EINES AXIALEN ENDES EINES RÖHRENFÖRMIGEN FERTIGPRODUKTES UND ZUR ENTLADUNG DIESES IN UMGEKEHRTER WEISE

PROCÉDÉ DE FERMETURE AUTOMATIQUE D'UNE EXTRÉMITÉ AXIALE D'UN PRODUIT MANUFACTURÉ TUBULAIRE ET POUR LE DÉLIVRER SENS DESSUS DESSOUS, ET APPAREIL POUR LA MISE EN OEUVRE DU PROCÉDÉ

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(73) Proprietor: **LONATI S.P.A.**
25124 Brescia (IT)

(72) Inventors:
- **LONATI, Ettore**
  I-25082 Botticino (IT)
- **LONATI, Tiberio**
  I-25123 Brescia (IT)
- **LONATI, Fausto**
  I-25123 Brescia (IT)

(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

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Description

[0001] The present invention relates to a method for closing automatically an axial end of a tubular manufacture and for unloading it in an inside-out configuration and to an apparatus for performing the method.

[0002] Methods and apparatuses are known for the automated closing of an axial end of a tubular manufacture, particularly of a sock, at the end of its productive cycle generally performed by means of a circular hosiery knitting machine or the like.

[0003] See WO-A-2008/028576. In many of these methods and apparatuses, the closing of an axial end of the manufacture is performed by sewing or linking with the manufacture in an inside-out configuration so that the sewing or linking is virtually invisible on the right side of the manufacture. At the end of the sewing or linking process, the manufacture is disengaged and moved away from the apparatus, performing also its reversing, i.e., its transition to the right-way-out configuration.

[0004] In particular, WO2009/112346 in the name of the same Applicant describes a method and an apparatus that allow closing an axial end of a tubular manufacture. The apparatus described in this patent comprises a sewing or linking station in which a handling device is positioned which is adapted to retain the manufacture, arranged with its axis substantially vertically, hung from said handling apparatus by means of a first axial end, which constitutes the axial end to be closed by sewing or linking. The handling device comprises an annular body that can be engaged with said axial end of the manufacture. The annular body is composed of two annular portions that are mutually pivoted around a diametrical axis of the ring-like body and one of these two annular portions can move rotatably about the diametrical axis with respect to the other annular portion so as to pass from a coplanar position to a position facing the other annular portion. The ring-like body is provided with a plurality of spikes which, when the two annular portions of the annular body are coplanar, extend parallel to the axis of the annular body and are distributed along the circumferential extension of the annular body. When an annular portion is arranged so as to face the other annular portion of the annular body, the spikes of one annular portion face and are aligned with the spikes of the other annular portion of the annular body.

[0005] In the apparatus described in WO2009/112346, to which reference is made for the sake of completeness of the description, the tubular manufacture, at the end of its production, is picked up from the circular hosiery knitting machine that has produced it and is transferred to the handling device arranged at the sewing or linking station. More particularly, the loops of knitting of the row of knitting formed last are each transferred by a needle of the hosiery knitting machine to a spike of the annular body of the handling device with the two annular portions in a coplanar position. The manufacture, which hangs with its axial end to be closed from the handling device and extends below it, is aspirated into a lower reversing tube, having a substantially vertical axis, that is supported below the handling device and faces with its upper axial end the annular body of the handling device. In this condition, the manufacture is in the right-way-out configuration. The lower reversing tube is then lifted and passed through the annular body of the handling device, turning up the tubular manufacture on the external lateral surface of said lower reversing tube. In this manner, the manufacture is still engaged by means of its first axial end with the spikes of the annular body of the handling device, but extends, in an inside-out configuration, above the same annular body of the handling device. An annular portion of the annular body of the handling device is rotated about the diametrical axis so as to face with its spikes the spikes of the other annular portion and the loops carried by the spikes of one annular portion are passed onto the spikes of the other annular portion, so that each one of said spikes carries two loops of knitting. A sewing or linking head joins the various pairs of loops carried by the spikes of an annular portion and the manufacture is disengaged from the spikes of the handling device and aspirated into the lower reversing tube through its lower axial end that is above the annular body of the handling device. Due to this aspiration, the manufacture, the first axial end of which has been closed, passes again into the right-way-out configuration and is moved away, in this configuration, from the apparatus used for closing said axial end.

[0006] Generally, it is preferred that the manufacture, at the end of its production cycle and of the closure of one of its axial ends, is in the right-way-out configuration because in this condition it can be subjected to the various finishing processes and then packaged.

[0007] However, in some cases it is required that the manufacture is unloaded from the apparatus used for closing one of its axial ends in the inside-out configuration, so that it can be subjected to at least part of the finishing operations in the inside-out configuration. This need is particularly felt, for example, for hosiery or other tubular manufactures that bear designs or particular patterns that leave tails of yarn on the reverse side of the manufacture which, during the finishing operations, might be pushed to exit from the right side of the manufacture, being thus visible on the finished manufacture.

[0008] There are similar needs when the finishing operations are particularly intense with respect to the yarns or the knitting performed and for this reason, if applied on the right side of the manufacture, might damage it or alter its look.

[0009] The aim of the present invention is to meet this need by devising a method that allows performing the automated closure of an axial end of a tubular manufacture and its unloading in an inside-out configuration.

[0010] Within this aim, an object of the invention is to propose a method that can be performed in a relatively simple manner and with high reliability and precision.

[0011] Another object of the invention is to provide an

apparatus for performing the method according to the invention that is relatively simple to provide.

[0012] Yet another object of the invention is to devise an apparatus for performing the method according to the invention that can be derived, with modifications that are easy to provide, from known apparatuses, for example of the type described in WO2009/112346.

[0013] A further object of the invention is to propose a method and an apparatus that allow closing an axial end of a tubular manufacture and unloading it in an inside-out configuration in an economically competitive manner.

[0014] This aim and these and other objects that will become more apparent hereinafter are achieved by a method for closing an axial end of a tubular manufacture and for unloading it in an inside-out configuration, comprising sequentially:

- a step of positioning the manufacture, in a right-way-out configuration, at a sewing or linking station, arranged so that its axis is substantially vertical and hangs, by means of a first axial end to be closed by sewing or linking, from an annular handling device, said manufacture extending below said handling device;
- a step of inserting the manufacture, retained by said handling device, into an upper reversing tube that is or can be positioned, with its lower axial end, above said handling device for the passage of the manufacture through said handling device, said passage arranging the manufacture in the inside-out configuration;
- a step of closing said first axial end of the manufacture by sewing or linking;
- a step of disengaging the manufacture from said handling device;
- a step of moving away the manufacture through the upper axial end of said upper reversing tube.

[0015] Further characteristics and advantages of the invention will become more apparent from the description of a preferred but not exclusive embodiment of the method according to the invention, as well as of the apparatus for performing the method, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figures 1 to 8 are schematic views of the sequence of steps of the method according to the invention, with the apparatus for performing the method shown schematically and in cross-section along a vertical plane;

Figure 1a is a view of an enlarged-scale detail of Figure 1;

Figure 2a is a view of an enlarged-scale detail of Figure 2;

Figure 3a is a view of an enlarged-scale detail of Figure 3;

Figure 4a is a view of an enlarged-scale detail of Figure 4;

Figure 5a is a view of an enlarged-scale detail of Figure 5;

Figure 6a is a view of an enlarged-scale detail of Figure 6;

Figure 7a is a view of an enlarged-scale detail of Figure 7;

Figure 8a is a view of an enlarged-scale detail of Figure 8;

Figures 9 and 10 are views of two variations of the steps of the method shown in Figures 4 and 5;

Figure 9a is an enlarged-scale view of a detail of Figure 9;

Figure 10a is an enlarged-scale view of a detail of Figure 10.

[0016] With reference to the cited figures, an apparatus for performing the method according to the invention, generally designated by the reference numeral 1, comprises: a handling device 2, which can engage a first axial end 50a of the manufacture 50 to be closed by sewing or linking, at least one upper reversing tube 3, which is supported by a supporting structure 4 above the handling device 2, and means 5 for sewing or linking the first axial end 50a of the manufacture 50, which can be operated on command in order to close said first axial end 50a of the manufacture 50 that is engaged with the handling device 2.

[0017] The upper reversing tube 3 preferably has a straight extension, is preferably arranged so that its axis 3a is vertical and can be moved on command along its axis 3a in relation to the supporting structure 4. The movement of the upper reversing tube 3 along its axis 3a can be obtained, for example, by supporting the upper reversing tube 3 so that it can slide along guides that have a vertical axis and are fixed to the supporting structure 4 and by providing an actuator, for example a fluid-operated cylinder or a screw-and-nut connection operated by an electric motor, that actuates the upper reversing tube 3 so as to translate it along said guides.

[0018] The upper reversing tube 3 is connected, with its upper axial end, to a duct 6 that can be connected to suction means of a known type, which are not illustrated for sake of simplicity.

[0019] Preferably, the handling device 2 comprises an annular body 7 composed of two annular portions 7a, 7b that are pivoted to each other about a diametrical axis 8. Under one operating condition, as will become more apparent hereinafter, the two annular portions 7a, 7b are substantially coplanar and are preferably arranged on a substantially horizontal plane. The annular body 7 is provided with a plurality of spikes 9 that are distributed around the axis of the annular body 7 along its entire circumferential extension. These spikes 9, when the two annular portions 7a, 7b are coplanar, are oriented parallel to the axis of the annular body 7 and their tip is directed downward. Each one of these spikes 9 can engage a loop of knitting of a row of knitting of the manufacture 50 arranged proximate to, or at, the first axial end 50a of the

manufacture 50 to be closed by sewing or linking. One of the two annular portions 7a, 7b, which is constituted in the illustrated case by the annular portion 7b, can rotate with respect to the other annular portion about the diametrical axis 8 so as to pass from the coplanar position to a reversed position in which it faces in a downward region the other annular portion 7a. In this reversed position, the annular portion 7b arranged in a downward region has its spikes 9 with the tip directed upward and faces a corresponding spike 9 of the annular portion 7a arranged above. In this position, each spike 9 of the annular portion 7b faces and is aligned with a corresponding spike 9 of the other annular portion 7a; moreover, each spike 9 of an annular portion 7a or 7b is in contact, by means of its tip, with the tip of the corresponding spike 9 of the other annular portion 7b or 7a so that a loop of knitting carried by a spike 9 of one annular portion can be transferred, by sliding, onto the corresponding spike 9 of the other annular portion.

[0020] Preferably, the apparatus for performing the method according to the invention comprises also a lower reversing tube 10, which preferably has a rectilinear extension and can be arranged so that its axis is vertical in a coaxial position with respect to the upper reversing tube 3. The lower reversing tube 10 is supported by its own supporting structure or by the same supporting structure 4 that supports the upper reversing tube 3. The lower reversing tube 10 is inserted coaxially into a supporting and guiding tube 11, which is arranged below the handling device 2 and is connected to the supporting structure 4. More particularly, the supporting and guiding tube 11 is inserted in a lower frame 12 that can be pivoted to the supporting structure 4 about a horizontal axis 13 located in an intermediate region of the longitudinal extension of the supporting and guiding tube 11, so that it can be inclined laterally, for example by operation of a linear actuator 14, so as to move the upper end of the supporting and guiding tube 11 closer to the circular hosiery knitting machine that produces the manufacture 50 whose axial end 50a has to be closed by sewing or linking, in a manner similar to the one provided for the lower part of the reversing device of WO2009/112346, or so as to move the lower reversing tube 10 so that its axis is vertical and coaxial with the upper reversing tube 3 and with the annular body 7 of the handling device 2.

[0021] The handling device 2 is served by a pick-up device 15, which has an annular body 16 which supports pick-up elements 17, which can engage the needles of the circular machine that produces the manufacture 50 and are adapted to pick up individually the loops of knitting of the manufacture that are retained on the needles of the machine. The pick-up device 15 can move on command from a pick-up position, in which it is arranged with its annular body 16 coaxially around the needle cylinder of the machine, to a release position, in which it is arranged with its annular body 16 at a sewing or linking station 18, spaced laterally with respect to the machine for producing the manufacture 50, where the apparatus 1 for performing the method according to the invention is arranged.

[0022] The pick-up elements 17 are arranged radially around the axis of the annular body 16 of the pick-up device 15 and are mutually angularly spaced around said axis in a manner that corresponds to the angular spacing among the needles of the circular hosiery knitting machine. In the illustrated embodiment, the end of each pick-up element 17 directed toward the axis of the annular body 16 is shaped like a hook with the tip directed upward and can engage a needle of the circular machine, for example in the same way as described in WO2009/112346, in order to pick up, from the corresponding needle, a loop of knitting of the manufacture 50.

[0023] The angular spacing of the spikes 9 around the axis of the handling device 2 corresponds to the angular spacing of the pick-up elements 17 around the axis of the pick-up device 15, so that by arranging the annular body 16 of the pick-up device 15 below and coaxially with the annular body 7 of the handling device 2 with the annular portions 7a, 7b in a coplanar position, each pick-up element 17 is arranged at a corresponding spike 9 in a manner that is suitable to allow the passage of a loop of knitting from a pick-up element 17 to the corresponding spike 9 of the handling device 2.

[0024] In the upper end of the lower frame 12 there is a seat that accommodates first axial pusher means 20 constituted by a ring-like body 21 that is arranged coaxially around the lower reversing tube 10. The ring-like body, similarly to what has been described in WO2009/112346, can move in relation to the handling device 2 and to the pick-up device 15 along the axis of the lower reversing tube 10, which coincides with the axis of the annular body 7 of the handling device 2 and with the axis 3a of the upper reversing tube 3, so as to pass the loops of knitting from the pick-up elements 17 of the pick-up device 15 to the spikes 9 of the handling device 2.

[0025] Conveniently, the handling device 2 comprises means for transferring the loops of knitting carried by the spikes 9 of one annular portion 7a to the spikes 9 of the other annular portion 7b when they face each other and means for disengaging the manufacture 50 from the spikes 9 of the handling device 2. The means for transferring the manufacture 50 and disengaging it from the handling device 2 comprise second axial pusher means 22, which are accommodated in the annular body 7 of the handling device 2, above the two annular portions 7a, 7b when they are coplanar, and interact with the spikes 9 of the handling device 2 to pass the loops of knitting from the spikes 9 of one annular portion 7a to the spikes 9 of the other annular portion 7b when one annular portion 7b is reversed below the other annular portion 7a, or to disengage the manufacture 50 from the spikes 9 of one annular portion, constituted in the case illustrated by the annular portion 7b, after the sewing or linking operation, as will become more apparent hereinafter.

[0026] The annular body 7 of the handling device 2 is connected coaxially around a hollow cylinder 23, having

a vertical axis, which is supported, so that it can rotate about its own axis, which coincides with the axis 3a, by the supporting structure 4. The annular portion 7a is fixed to the outer lateral surface of the hollow cylinder 23, while the annular portion 7b is pivoted to the hollow cylinder 23 about the diametrical axis 8.

[0027] The hollow cylinder 23 and therefore the annular body 7 of the handling device 2 can rotate about the axis 3a relatively to the supporting structure 4 due to the action of an electric motor 27, for example in a manner similar to what is described in WO2009/112346.

[0028] The apparatus for performing the method according to the invention also comprises a sewing or linking head 24 arranged proximate to the handling device 2.

[0029] The sewing or linking head 24 is provided, in a manner known per se, with sewing elements, constituted for example by a needle and a looper or by a needle and a yarn loading tube or by two needles, so as to perform a sewing or linking chain. The sewing or linking head 24 is furthermore provided, proximate to the sewing elements, with a horizontal support 25 intended to support the annular portion 7b when it is reversed below the annular portion 7a and while is rotated about the axis 3a together with the hollow cylinder 23.

[0030] The sewing or linking head 24 is provided with an electric motor 26 for actuation of the sewing elements and the actuation of the electric motor 26 is synchronized with the actuation of the electric motor 27 that actuates the annular body 7 of the handling device 2 so that in each instance the needle of the sewing or linking head 24 engages a spike 9 of the annular portion 7b that carries a pair of loops of knitting of the manufacture 50, joining them.

[0031] The sewing or linking head 24 is provided with a cutter, of the known type and not illustrated for the sake of simplicity, for cutting the sewing or linking chain at the end of the sewing or linking process.

[0032] The sewing or linking head 24 is mounted on a slider 28 that is integral with drive shafts 29 which are oriented so that their axes are horizontal and which are supported, so they can slide along their axes, by the supporting structure 4. A linear actuator of a known type, not illustrated for the sake of simplicity, operates on the slider 28, such as for example a fluid-operated cylinder or an electric motor connected to the slider 28 through a screw-and-nut linkage, which causes the translation on command of the slider 28 and therefore of the sewing or linking head 24 toward the axis of the handling device 2 so as to move the sewing or linking head 24 to a position adapted to interact with the spikes 9 of the annular portion or away from the axis of the handling device 2 so as not to obstruct the positioning of the pick-up device 15 in the sewing or linking station 18 and the reversing of the annular portion 7b relatively to the annular portion 7a about the diametrical axis 8.

[0033] Operation of the apparatus described above, in performing the method according to the invention, is as follows.

[0034] The manufacture 50, picked up by means of the pick-up device 15 from the circular hosiery knitting machine 18 that produced it, is transferred, by the same pick-up device 15, to the sewing or linking station 18.

[0035] The manufacture 50 hangs, with the loops of one of its rows of knitting, preferably with the loops of the last row of knitting formed by the needles of the circular hosiery knitting machine, from the pick-up elements 17.

[0036] The handling device 2 is arranged with the two annular portions 7a, 7b in a coplanar position, waiting for the manufacture 50.

[0037] The lower reversing tube 10 is spaced with its upper axial end in a downward region with respect to the handling device 2.

[0038] The pick-up device 15 is arranged so as to face in a downward region the handling device 2 (Figures 1 and 1a) and is then lifted toward the handling device 2 so that each pick-up element 17 engages a spike 9 of the pick-up device 15 (Figures 2 and 2a).

[0039] At this point the ring-like body 21 of the first axial pusher means 20 is lifted toward the pick-up device 15 and the handling device 2 so as to cause the passage of each loop of knitting from a pick-up element 17 to a spike 9 of the handling device 2 (Figures 3 and 3a).

[0040] In this step of the method, the manufacture 50 is in the right-way-out configuration, is arranged so that its axis is substantially vertical and hangs, by means of a first axial end 50a to be closed by sewing or linking, from the handling device 2 and extends below the handling device 2.

[0041] Preferably, the manufacture 50 is aspirated inside the lower reversing tube 10.

[0042] The manufacture 50 is then inserted inside the upper reversing tube 3 so as to cause its transfer into the inside-out configuration with its first axial end 50a still engaged with the spikes 9 of the handling device 2.

[0043] The insertion of the manufacture 50 inside the upper reversing tube 3 can be performed as illustrated in Figures 4, 4a, 5, 5a. In practice, the lower reversing tube 10, into which the manufacture 50 has been aspirated beforehand, is lifted along its axis so as to pass through the annular body 7 of the handling device 2 and to enter, with a portion starting from its upper axial end, the lower axial end of the upper reversing tube 3 (Figures 4, 4a, 5, 5a). The lifting and the passage of the lower reversing tube 10, which contains the manufacture 50, through the annular body 7 of the handling device 2 turns up the manufacture 50 on the outer lateral surface of the lower reversing tube 10 that is arranged above the handling device 2. In this manner, the manufacture 50 passes to the inside-out configuration. The upper reversing tube 3 is connected to a suction device so as to retain the manufacture 50.

[0044] As an alternative, the insertion of the manufacture 50 into the upper reversing tube 3 can be performed as illustrated in Figures 9, 9a, 10, 10a. In practice, the upper reversing tube 3 is lowered along its own axis 3a until its lower axial end is proximate to the handling device

2 (Figures 9, 9a) and is connected to a suction device so as to aspirate the manufacture 50 into it, causing the manufacture 50 to pass through the handling device 2. In this manner, the manufacture 50 passes to the inside-out configuration. Optionally, the passage of the manufacture 50 into the upper reversing tube 3 can be assisted by lifting of the lower reversing tube 10, into which the manufacture 50 was aspirated beforehand, until its upper axial end is proximate to the handling device 2, and by connection of the lower reversing tube 10 to a compressed air line so that it delivers a jet of air through its upper axial end so as to propel the manufacture 50 into the upper reversing tube 3 (Figures 9, 9a, 10, 10a).

[0045] Subsequently, the lower reversing tube 10 is lowered, bringing it again inside the supporting and guiding tube 11, while the manufacture 50 is retained, in the inside-out configuration, inside the upper reversing tube 3, which is lifted above the handling device 2, and the pick-up device 15 is moved away from the handling device 2 (Figures 6, 6a).

[0046] In this manner, the manufacture 50 is engaged, by means of its first axial end 50a to be closed, with the spikes 9 of the handling device 2 and is retained, in the inside-out configuration, inside the upper reversing tube 3.

[0047] With the manufacture 50 in this position, the annular portion 7b of the annular body 7 of the handling device 2 is reversed about the diametrical axis 8 and arranged so as to face in a downward region the other annular portion 7a so that the spikes 9 of the annular portion 7b face and are aligned with the spikes 9 of the other annular portion 7a. By actuation of the second axial pusher means 22, the loops of knitting carried by the spikes 9 of the annular portion 7b arranged above are transferred to the spikes 9 of the annular portion 7b arranged below. In this manner, each spike 9 of the annular portion 7b that is arranged below carries two loops of knitting.

[0048] The sewing or linking head 24 is then moved closer to the handling device 2 and its sewing elements are actuated synchronously with the rotation of the annular body 7 of the handling device 2 so as to perform progressively the sewing or linking of the loops of knitting carried by the spikes 9. In this manner, the axial end 50a of the manufacture 50 engaged with the handling device 2 is closed (Figures 7 and 7a).

[0049] Once the sewing or linking operation has ended, the sewing or linking head 24 is moved away laterally from the handling device 2 and the annular portion 7b is returned to the coplanar position with respect to the other annular portion 7a. By means of a new actuation of the second axial pusher means 22, the manufacture 50 is disengaged from the spikes 9 and, due to the suction applied to the upper reversing tube 3, is extracted, in the inside-out configuration, from the upper axial end of the upper reversing tube 3 and unloaded outside the apparatus through the duct 6 (Figures 8, 8a).

[0050] It should be noted that although it is preferred that the manufacture 50 be picked up from the production machine and transferred to the spikes 9 of the handling device 2 with a loop of knitting for each spike 9, the pick-up and transfer can be performed also with other methods, such as for example a method that entails gripping the manufacture 50 also at a row of knitting that is not the last row of knitting formed and with multiple loops of knitting for each pick-up element 17 and for each spike 9.

[0051] In practice it has been found that the method according to the invention fully achieves the intended aim, since it allows performing the automated closure of an axial end of a tubular manufacture, for example of a hosiery item, and to unload the manufacture in the inside-out configuration so as to make it available for finishing operations in this configuration.

[0052] It is important to note that although the manufacture is unloaded in the inside-out configuration, the closing of one of its axial ends by sewing or linking is performed with the manufacture in the inside-out configuration, making the chain of linking or the stitches of sewing practically invisible on the right side of the manufacture and therefore with a fully satisfactory result from an aesthetic point of view.

[0053] A further advantage of the method according to the invention is that it can be performed with an apparatus that can be derived, with modifications that are very easy to provide, from apparatuses that are already available, such as for example the apparatus described in WO2009/112346.

[0054] The method and the apparatus for performing it, thus conceived, are susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with other technically equivalent elements.

[0055] In practice, the materials used, as well as the dimensions, may be any according to the requirements and the state of the art.

[0056] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A method for closing an axial end of a tubular manufacture and for unloading it in an inside-out configuration, comprising sequentially:

   - a step of positioning the manufacture (50), in a right-way-out configuration, at a sewing or linking station (18), arranged so that its axis is substantially vertical and so that it hangs, by means of a first axial end (50a) to be closed by sewing or linking, from an annular handling device (2),

said manufacture (50) extending below said handling device (2);
- a step of inserting the manufacture (50), retained by said handling device (2), inside an upper reversing tube (3) that is or can be positioned, with its lower axial end, above said handling device (2) for the passage of the manufacture (50) through said handling device (2), said passage arranging the manufacture (50) in the inside-out configuration;
- a step of closing said first axial end (50a) of the manufacture (50) by sewing or linking;
- a step of disengaging the manufacture (50) from said handling device (2);
- a step of removing the manufacture (50) through the upper axial end of said upper reversing tube (3).

2. The method according to claim 1, **characterized in that** said step of inserting the manufacture (50) in said upper reversing tube (3) is performed by performing in sequence the following actions:

- aspirating beforehand the manufacture (50), which hangs with said first axial end (50a) from said handling device (2), into a lower reversing tube (10) that faces, with its upper axial end, said handling device (2);
- lifting said lower reversing tube (10) in order to make its upper axial end pass through said handling device (2) and enter the lower axial end of said upper reversing tube (3) that is arranged above said handling device (2);
- removing said lower reversing tube (10) below said handling device (2), retaining the manufacture (50) in said upper reversing tube (3).

3. The method according to claim 1, **characterized in that** said step of inserting the manufacture (50) in said upper reversing tube (3) is performed by performing in sequence the following actions:

- arranging the lower axial end of said upper reversing tube (3), which is arranged so that its axis (3a) is substantially vertical, adjacent to said handling device (2);
- aspirating the manufacture (50) into said upper reversing tube (3), causing the manufacture (50), which hangs with said first axial end thereof (50a) from said handling device (2), to pass through said handling device (2);
- lifting said upper reversing tube (3) above said handling device (2).

4. The method according to claim 1, **characterized in that** said step of inserting the manufacture (50) into said upper reversing tube (3) is performed by performing in sequence the following actions:

- aspirating beforehand the manufacture (50), which hangs with said first axial end (50a) from said handling device (2), into a lower reversing tube (10) that is arranged so that its axis is substantially vertical and so that it faces with its upper axial end said handling device (2);
- arranging the lower axial end of said upper reversing tube (3), which is arranged so that its axis (3a) is substantially vertical, adjacent to said handling device (2);
- aspirating the manufacture (50) into said upper reversing tube (3), causing the manufacture (50), which hangs with said first axial end (50a) from said handling device (2), to pass through said handling device (2);
- assisting the aspiration of the manufacture (50) into said upper reversing tube (3) by means of a pressurized air stream that is dispensed through the upper axial end of said lower reversing tube (10) toward said upper reversing tube (3);
- lifting said upper reversing tube (3) above said handling device (2).

5. An apparatus for performing the method according to one or more of the preceding claims, **characterized in that** it comprises:

- a handling device (2), which can engage a first axial end (50a) of the manufacture (50) to be closed by sewing or linking;
- an upper reversing tube (3), which is supported by a supporting structure (4) above said handling device (2);
- means for sewing or linking (5) said first axial end (50a) of the manufacture (50), which can be operated to close said first axial end (50a) of the manufacture (50) that is engaged with said handling device (2);

said handling device (2) being able to be disengaged on command from the manufacture (50) and said upper reversing tube (3) being connectable to suction means for drawing the manufacture (50) through its lower axial end and/or retain the manufacture (50) inside it and move away the manufacture (50) upon its disengagement from said handling device (2).

6. The apparatus according to claim 5, **characterized in that** it comprises a lower reversing tube (10) that is supported by a supporting structure (4) below said handling device (2), said lower reversing tube (10) being connectable to suction means and/or to means for feeding compressed air.

7. The apparatus according to claim 5 or 6, **characterized in that** said lower reversing tube (10) and said upper reversing tube (3) have a rectilinear extension,

are arranged so that their axes are vertical and are substantially coaxial.

8. The apparatus according to one or more of claims 5 to 7, **characterized in that** said lower reversing tube (10) can move with respect to said supporting structure (4) along its axis so as to enter partially, with its upper axial end, the lower axial end of said upper reversing tube (3).

9. The apparatus according to one or more of claims 5 to 8, **characterized in that** said handling device (2) comprises an annular body (7) that is composed of two annular portions (7a, 7d) that are pivoted to each other about a diametrical axis 8; one annual portion (7b) of said two annular portions (7a, 7b) being able to rotate with respect to the other annular portion (7a) about said diametrical axis (8) in order to pass from a position that is co-planar with the other annular portion (7a) to a position that faces the other annular portion (7a); said annular body (7) supporting a plurality of spikes (9) that are distributed along the circumferential extension of said annular body (7) and are arranged, with said two annular portions (7a, 7b) in a coplanar position, so that their axis is vertical and so that their tip is directed downward; each one of said spikes (9) being able to engage with a loop of knitting of a row of knitting proximate to, or at, said first axial end (50a) of the manufacture (50); said annular body (7) being arranged coaxially with said upper reversing tube (3) and with said lower reversing tube (10); the spikes (9) of one annular portion (7b), in the position that faces the other annular portion (7a), facing and being aligned with the spikes (9) of the other annular portion (7a); means being provided for transferring the loops of knitting arranged on the spikes (9) of one annular portion (7a) to the spikes (9) of the other annular portion (7b), and means being provided for disengaging the loops of knitting from said spikes (9).

Patentansprüche

1. Ein Verfahren zum Schließen eines axialen Endes eines röhrenförmigen Produkts und zum Abladen desselben in einer auf links gedrehten Anordnung, das nacheinander Folgendes umfasst:

- einen Schritt des Positionierens des Produkts (50), in einer Anordnung mit der richtigen Seite nach außen, an einer Näh- oder Kettelstation (18), so angeordnet, dass seine Achse im Wesentlichen vertikal ist, und so, dass es an einem ersten axialen Ende (50a), das durch Nähen oder Ketteln zu schließen ist, von einer ringförmigen Handhabungsvorrichtung (2) herabhängt, wobei das Produkt (50) sich unterhalb der Handhabungsvorrichtung (2) erstreckt;
- einen Schritt des Einführens des Produkts (50), das von der Handhabungsvorrichtung (2) gehalten wird, in ein oberes Umkehrrohr (3), das mit seinem unteren axialen Ende über der Handhabungsvorrichtung (2) positioniert ist oder positioniert werden kann, zum Zwecke des Durchlaufs des Produkts (50) durch die Handhabungsvorrichtung (2), wobei der Durchlauf das Produkt (50) in der auf links gedrehten Anordnung arrangiert;
- einen Schritt des Schließens des ersten axialen Endes (50a) des Produkts (50) durch Nähen oder Ketteln;
- einen Schritt des Lösens des Produkts (50) von der Handhabungsvorrichtung (2);
- einen Schritt des Entfernens des Produkts (50) durch das obere axiale Ende des oberen Umkehrrohrs (3).

2. Das Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Einführens des Produkts (50) in das obere Umkehrrohr (3) durchgeführt wird, indem nacheinander folgende Arbeiten durchgeführt werden:

- zunächst das Ansaugen des Produkts (50), das mit dem ersten axialen Ende (50a) von der Handhabungsvorrichtung (2) herabhängt, in ein unteres Umkehrrohr (10), das mit seinem oberen axialen Ende der Handhabungsvorrichtung (2) zugewandt ist;
- Anheben des unteren Umkehrrohrs (10), um sein oberes axiales Ende durch die Handhabungsvorrichtung (2) dringen zu lassen und das untere axiale Ende des oberen Umkehrrohrs (3), das oberhalb der Handhabungsvorrichtung (2) angeordnet ist, einzuführen;
- Entfernen des unteren Umkehrrohrs (10) unterhalb der Handhabungsvorrichtung (2), wobei das Produkt (50) in dem oberen Umkehrrohr (3) gehalten wird.

3. Das Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Einführens des Produkts (50) in das obere Umkehrrohr (3) durchgeführt wird, indem nacheinander folgende Arbeiten durchgeführt werden:

- Anordnen des unteren axialen Endes des oberen Umkehrrohrs (3), das so angeordnet ist, dass seine Achse (3a) im Wesentlichen vertikal ist, angrenzend an die Handhabungsvorrichtung (2);
- Ansaugen des Produkts (50) in das obere Umkehrrohr (3), wodurch das Produkt (50), das mit seinem ersten axialen Ende (50a) von der Handhabungsvorrichtung (2) herabhängt, veranlasst

wird, die Handhabungsvorrichtung (2) zu durchlaufen;
- Anheben des oberen Umkehrrohrs (3) über die Handhabungsvorrichtung (2).

4. Das Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Einführens des Produkts (50) in das obere Umkehrrohr (3) durchgeführt wird, indem nacheinander folgende Arbeiten durchgeführt werden:

- zunächst Ansaugen des Produkts (50), das an dem ersten axialen Ende (50a) von der Handhabungsvorrichtung (2) herabhängt, in ein unteres Umkehrrohr (10), das so angeordnet ist, dass seine Achse im Wesentlichen vertikal ist, und so, dass es mit seinem oberen axialen Ende der Handhabungsvorrichtung (2) zugewandt ist;
- Anordnen des unteren axialen Endes des oberen Umkehrrohrs (3), das so angeordnet ist, dass seine Achse (3a) im Wesentlichen vertikal ist, angrenzend an die Handhabungsvorrichtung (2);
- Ansaugen des Produkts (50) in das obere Umkehrrohr (3), wodurch das Produkt (50), das an dem ersten axialen Ende (50a) von der Handhabungsvorrichtung (2) herabhängt, veranlasst wird, die Handhabungsvorrichtung (2) zu durchlaufen;
- Unterstützen des Ansaugens des Produkts (50) in das obere Umkehrrohr (3) mit Hilfe eines Druckluftstroms, der durch das obere axiale Ende des unteren Umkehrrohrs (10) zu dem oberen Umkehrrohr (3) hin ausgestoßen wird;
- Anheben des oberen Umkehrrohrs (3) über die Handhabungsvorrichtung (2).

5. Eine Vorrichtung zum Durchführen des Verfahrens gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Folgendes umfasst:

- eine Handhabungsvorrichtung (2), die ein erstes axiales Ende (50a) des Produkts (50) halten kann, das durch Nähen oder Ketteln verschlossen werden soll;
- ein oberes Umkehrrohr (3), das von einer tragenden Struktur (4) oberhalb der Handhabungsvorrichtung (2) getragen wird;
- Mittel zum Nähen oder Ketteln (5) des ersten axialen Endes (50a) des Produkts (50), die zum Verschließen des ersten axialen Endes (50a) des Produkts (50) betätigt werden können, das von der Handhabungsvorrichtung (2) gehalten wird;
- wobei die Handhabungsvorrichtung (2) in der Lage ist, auf Befehl vom Produkt (50) getrennt zu werden, und das obere Umkehrrohr (3) mit Saugmitteln verbindbar ist, um das Produkt (50) durch sein unteres axiales Ende zu ziehen und/oder das Produkt (50) in seinem Inneren zu halten und das Produkt (50) nach seiner Trennung von der Handhabungsvorrichtung (2) fort zu bewegen.

6. Die Vorrichtung gemäß Anspruch 5, **dadurch gekennzeichnet, dass** sie ein unteres Umkehrrohr (10) umfasst, das von einer tragenden Struktur (4) unterhalb der Handhabungsvorrichtung (2) getragen wird, wobei das untere Umkehrrohr (10) mit Saugmitteln und/oder mit Mitteln für die Zufuhr von Druckluft verbindbar ist.

7. Die Vorrichtung gemäß Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** das untere Umkehrrohr (10) und das obere Umkehrrohr (3) eine geradlinige Ausdehnung haben, so angeordnet sind, dass ihre Achsen vertikal sind, und im Wesentlichen koaxial sind.

8. Die Vorrichtung gemäß einem oder mehreren der Ansprüche 5 bis 7, **dadurch gekennzeichnet, dass** das untere Umkehrrohr (10) sich im Verhältnis zu der tragenden Struktur (4) so entlang seiner Achse bewegen kann, dass es mit seinem oberen axialen Ende teilweise in das untere axiale Ende des oberen Umkehrrohrs (3) eindringt.

9. Die Vorrichtung gemäß einem oder mehreren der Ansprüche 5 bis 8, **dadurch gekennzeichnet, dass** die Handhabungsvorrichtung (2) einen Ringkörper (7) umfasst, der aus zwei ringförmigen Abschnitten (7a, 7d) besteht, welche um eine diametrale Achse 8 schwenkbar miteinander verbunden sind, wobei ein ringförmiger Abschnitt (7b) der beiden ringförmigen Abschnitte (7a, 7b) sich im Verhältnis zu dem anderen ringförmigen Abschnitt (7a) um die diametrale Achse (8) drehen kann, um aus einer Position, die koplanar mit dem anderen ringförmigen Abschnitt (7a) ist, in eine Position überzugehen, die dem anderen ringförmigen Abschnitt (7a) gegenüberliegt; wobei der Ringkörper (7) eine Vielzahl von Dornen (9) trägt, die entlang der Umfangsausdehnung des Ringkörpers (7) verteilt und, wenn sich die beiden ringförmigen Abschnitte (7a, 7b) in einer koplanaren Position befinden, so angeordnet sind, dass ihre Achse vertikal ist, und so, dass ihre Spitze nach unten gerichtet ist, wobei jeder der Dornen (9) in der Lage ist, in eine Strickschlaufe einer Strickreihe nahe, oder an, dem ersten axialen Ende (50a) des Produkts (50) einzugreifen; wobei der Ringkörper (7) koaxial mit dem oberen Umkehrrohr (3) und mit dem unteren Umkehrrohr (10) angeordnet ist und die Dornen (9) eines ringförmigen Abschnitts (7b) in der Position, die dem anderen ringförmigen Abschnitt (7a) gegenüberliegt, den Dornen (9) des anderen ringförmigen Abschnitts (7a) zugewandt sind

und mit ihnen fluchten; wobei Mittel bereitgestellt ist, um die Strickschlaufen, die auf den Dornen (9) eines ringförmigen Abschnitts (7a) angeordnet sind, auf die Dornen (9) des anderen ringförmigen Abschnitts (7b) zu übertragen, und Mittel bereitgestellt sind, um die Strickschlaufen von den Dornen (9) zu lösen.

Revendications

1. Procédé pour fermer une extrémité axiale d'un produit manufacturé tubulaire et pour le décharger dans une configuration à l'envers, comprenant séquentiellement :

- une étape de positionnement du produit manufacturé (50), dans une configuration à l'endroit, sur un poste de couture ou de remaillage (18), agencé de sorte que son axe est sensiblement vertical et de sorte qu' il est suspendu, au moyen d'une première extrémité axiale (50a) devant être fermée par couture ou remaillage, à un dispositif de manipulation annulaire (2), ledit produit manufacturé (50) s'étendant sous ledit dispositif de manipulation (2) ;
- une étape d'insertion du produit manufacturé (50), retenu par ledit dispositif de manipulation (2), à l'intérieur d'un tube d'inversion supérieur (3) qui est ou peut être positionné, avec son extrémité axiale inférieure, au-dessus dudit dispositif de manipulation (2) pour le passage du produit manufacturé (50) à travers ledit dispositif de manipulation (2), ledit passage agençant le produit manufacturé (50) dans la configuration à l'envers ;
- une étape de fermeture de ladite première extrémité axiale (50a) du produit manufacturé (50) par couture ou remaillage ;
- une étape de libération du produit manufacturé (50) dudit dispositif de manipulation (2);
- une étape de retrait du produit manufacturé (50) à travers l'extrémité axiale supérieure dudit tube d'inversion supérieur (3).

2. Procédé selon la revendication 1, **caractérisé en ce que** ladite étape d'insertion du produit manufacturé (50) dans ledit tube d'inversion supérieur (3) est réalisée en exécutant les actions suivantes les unes à la suite des autres :

- aspirer au préalable le produit manufacturé (50), qui est suspendu avec ladite première extrémité axiale (50a) audit dispositif de manipulation (2), dans un tube d'inversion inférieur (10) qui est dirigé, avec son extrémité axiale supérieure, vers ledit dispositif de manipulation (2) ;
- lever ledit tube d'inversion inférieur (10) afin de faire passer son extrémité axiale supérieure à travers ledit dispositif de manipulation (2) et faire entrer l'extrémité axiale inférieure dudit tube d'inversion supérieur (3) qui est agencé au-dessus du dispositif de manipulation (2) ;
- retirer ledit tube d'inversion inférieur (10) sous ledit dispositif de manipulation (2), en retenant le produit manufacturé (50) dans ledit tube d'inversion supérieur (3).

3. Procédé selon la revendication 1, **caractérisé en ce que** ladite étape d'insertion du produit manufacturé (50) dans ledit tube d'inversion supérieur (3) est réalisée en exécutant les actions suivantes les unes à la suite des autres :

- agencer l'extrémité axiale inférieure dudit tube d'inversion supérieur (3), qui est agencé de sorte que son axe (3a) est sensiblement vertical, au voisinage dudit dispositif de manipulation (2);
- aspirer le produit manufacturé (50) dans ledit tube d'inversion supérieur (3), en faisant passer le produit manufacturé (50), qui est suspendu avec ladite première extrémité axiale de celui-ci (50a) audit dispositif de manipulation (2), à travers ledit dispositif de manipulation (2) ;
- lever ledit tube d'inversion supérieur (3) au-dessus dudit dispositif de manipulation (2).

4. Procédé selon la revendication 1, **caractérisé en ce que** ladite étape d'insertion du produit manufacturé (50) dans ledit tube d'inversion supérieur (3) est réalisée en exécutant les actions suivantes les unes à la suite des autres :

- aspirer au préalable le produit manufacturé (50), qui est suspendu avec ladite première extrémité axiale (50a) audit dispositif de manipulation (2), dans un tube d'inversion inférieur (10) qui est agencé de sorte que son axe est sensiblement vertical et de sorte qu'il est dirigé avec son extrémité axiale supérieure vers ledit dispositif de manipulation (2) ;
- agencer l'extrémité axiale inférieure dudit tube d'inversion supérieur (3), qui est agencé de sorte que son axe (3a) est sensiblement vertical, au voisinage dudit dispositif de manipulation (2) ;
- aspirer le produit manufacturé (50) dans ledit tube d'inversion supérieur (3), en faisant passer le produit manufacturé (50), qui est suspendu avec ladite première extrémité axiale (50a) audit dispositif de manipulation (2), à travers ledit dispositif de manipulation (2) ;
- assister l'aspiration du produit manufacturé (50) dans ledit tube d'inversion supérieur (3) au moyen d'un flux d'air mis sous pression qui est distribué à travers l'extrémité axiale supérieure dudit tube d'inversion inférieur (10) vers ledit tu-

be d'inversion supérieur (3) ;
- lever ledit tube d'inversion supérieur (3) au-dessus dudit dispositif de manipulation (2).

5. Appareil pour mettre en oeuvre le procédé selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend :

- un dispositif de manipulation (2), qui peut venir en prise avec une première extrémité axiale (50a) du produit manufacturé (50) devant être fermée par couture ou remaillage ;
- un tube d'inversion supérieur (3), qui est supporté par une structure de support (4) au-dessus dudit dispositif de manipulation (2) ;
- des moyens pour coudre ou remailler (5) ladite première extrémité axiale (50a) du produit manufacturé (50), qui peuvent être actionnés pour fermer ladite première extrémité axiale (50a) du produit manufacturé (50) qui est en prise avec ledit dispositif de manipulation (2) ;

ledit dispositif de manipulation (2) pouvant être libéré sur commande du produit manufacturé (50) et ledit tube d'inversion supérieur (3) pouvant être relié à des moyens d'aspiration pour tirer le produit manufacturé (50) à travers leur extrémité axiale et/ou retenir le produit manufacturé (50) à l'intérieur d'eux et éloigner le produit manufacturé (50) lors de sa libération dudit dispositif de manipulation (2).

6. Appareil selon la revendication 5, **caractérisé en ce qu'**il comprend un tube d'inversion inférieur (10) qui est supporté par une structure de support (4) sous ledit dispositif de manipulation (2), ledit tube d'inversion inférieur (10) pouvant être relié à des moyens d'aspiration et/ou à des moyens pour alimenter de l'air comprimé.

7. Appareil selon la revendication 5 ou 6, **caractérisé en ce que** ledit tube d'inversion inférieur (10) et ledit tube d'inversion supérieur (3) ont une extension rectiligne, sont agencés de sorte que leurs axes sont verticaux et sont sensiblement coaxiaux.

8. Appareil selon une ou plusieurs des revendications 5 à 7, **caractérisé en ce que** ledit tube d'inversion inférieur (10) peut se déplacer par rapport à ladite structure de support (4) le long de son axe de manière à pénétrer partiellement, avec son extrémité axiale supérieure, dans l'extrémité axiale inférieure dudit tube d'inversion supérieur (3).

9. Appareil selon une ou plusieurs des revendications 5 à 8, **caractérisé en ce que** ledit dispositif de manipulation (2) comprend un corps annulaire (7) qui est composé de deux portions annulaires (7a, 7b) qui pivotent l'une sur l'autre autour d'un axe diamétral (8) ; une portion annulaire (7b) desdits deux portions annulaires (7a, 7b) pouvant tourner par rapport à l'autre portion annulaire (7a) autour dudit axe diamétral (8) afin de passer d'une position qui est coplanaire à l'autre portion annulaire (7a) à une position qui est dirigée vers l'autre portion annulaire (7a) ; ledit corps annulaire (7) supportant une pluralité de pointes (9) qui sont réparties le long de l'extension circonférentielle dudit corps annulaire (7) et sont agencées, avec lesdites deux portions annulaires (7a, 7b) dans une position coplanaire, de sorte que leur axe est vertical et de sorte que leur bout est dirigé vers le bas ; chacune desdites pointes (9) pouvant venir en prise avec une boucle de tricot d'une rangée de tricot à proximité de, ou sur, ladite première extrémité axiale (50a) du produit manufacturé (50) ; ledit corps annulaire (7) étant agencé coaxialement audit tube d'inversion supérieur (3) et audit tube d'inversion inférieur (10) ; les pointes (9) d'une portion annulaire (7b), dans la position qui est dirigée vers l'autre portion annulaire (7a), dirigées vers les pointes (9) de l'autre portion annulaire (7a) et étant alignées avec celles-ci ; des moyens étant prévus pour transférer les boucles de tricot agencées sur les pointes (9) d'une portion annulaire (7a) jusqu'aux pointes (9) de l'autre portion annulaire (7b), et des moyens étant prévus pour libérer les boucles de tricot desdites pointes (9).

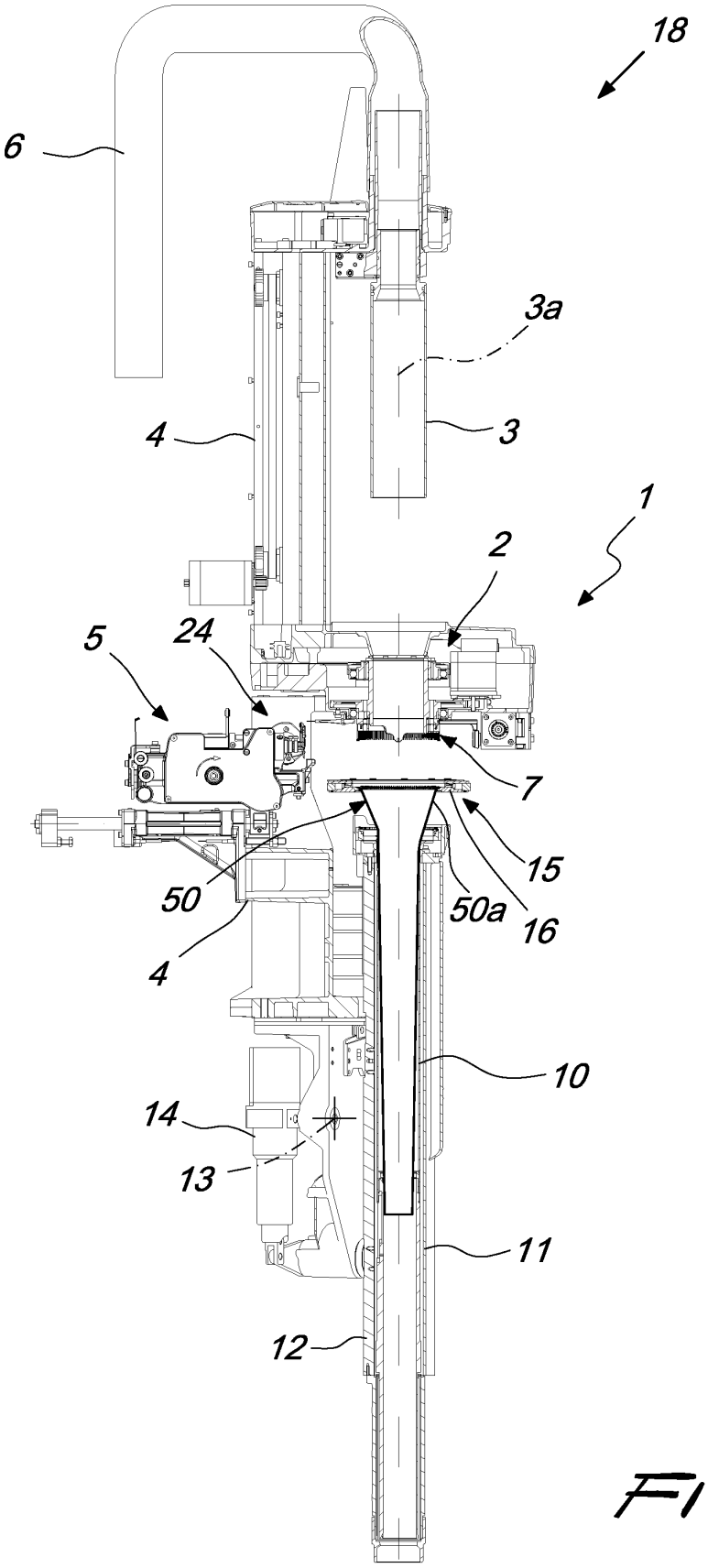


Fig. 1

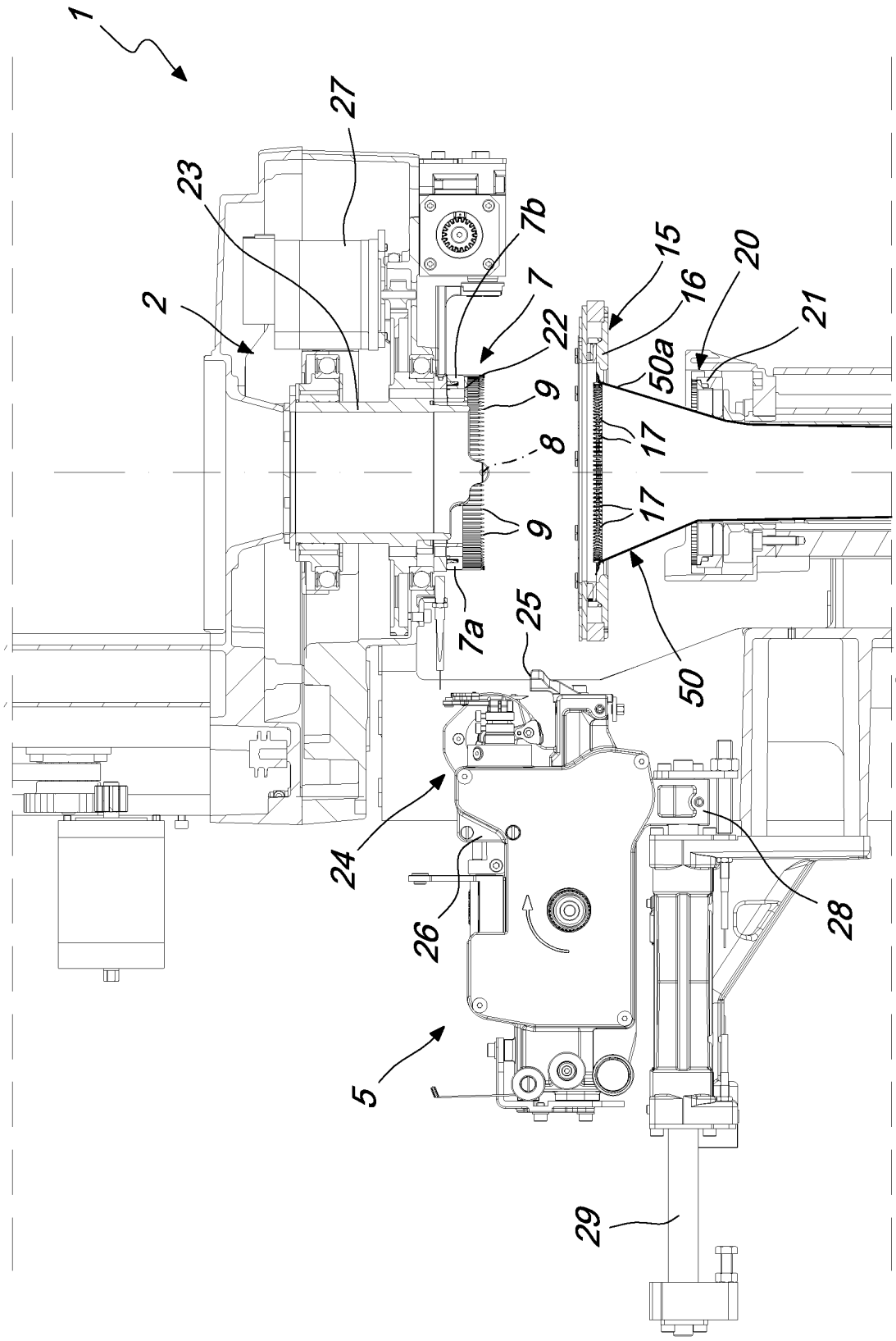


Fig. 1a

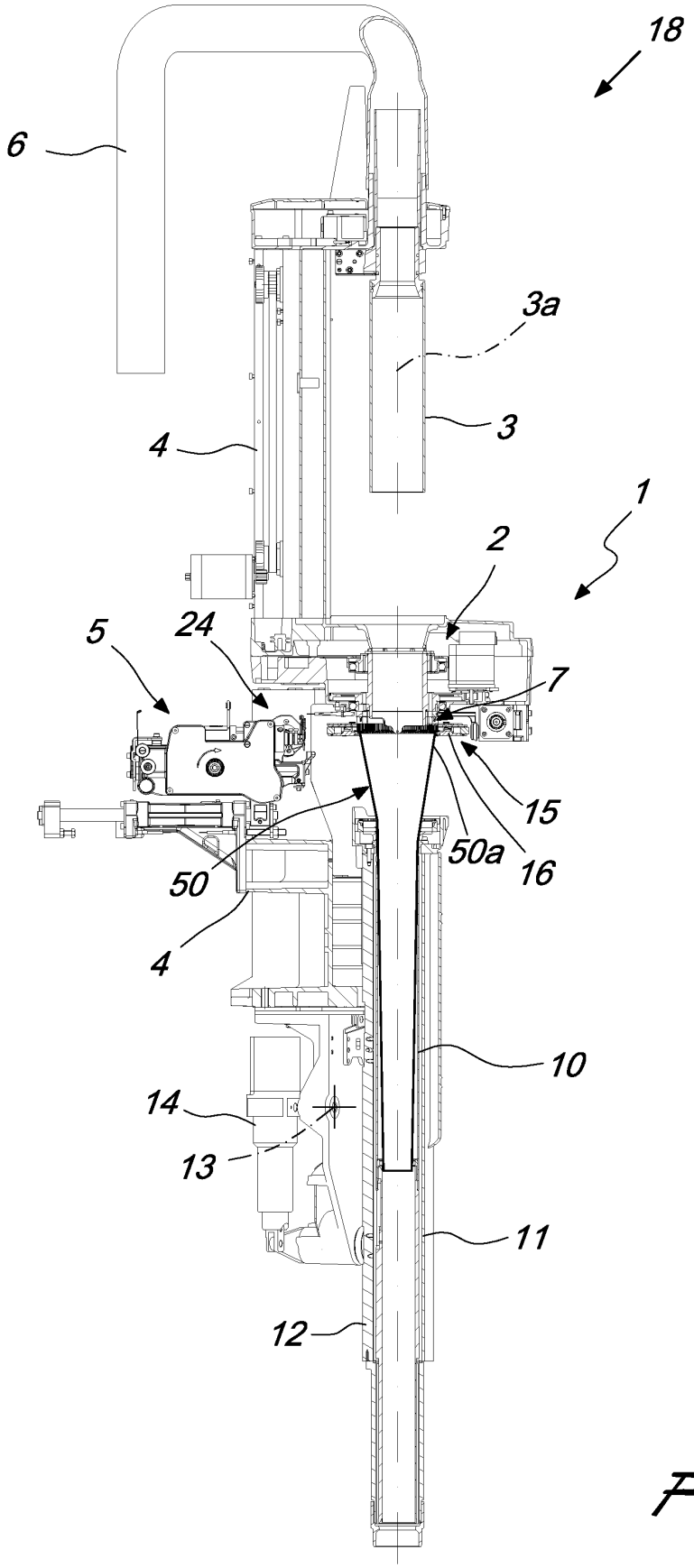


Fig. 2

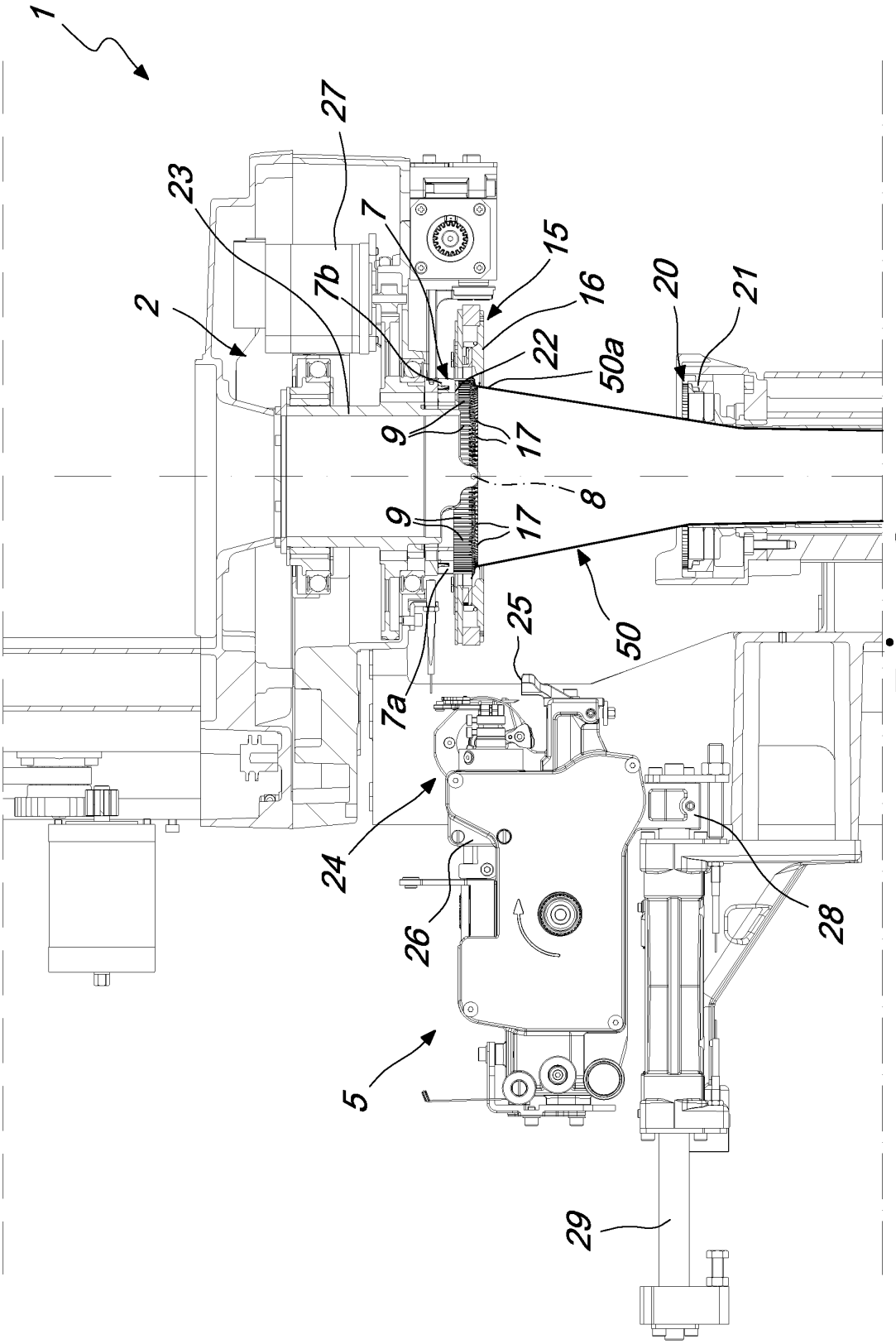


Fig. 2a

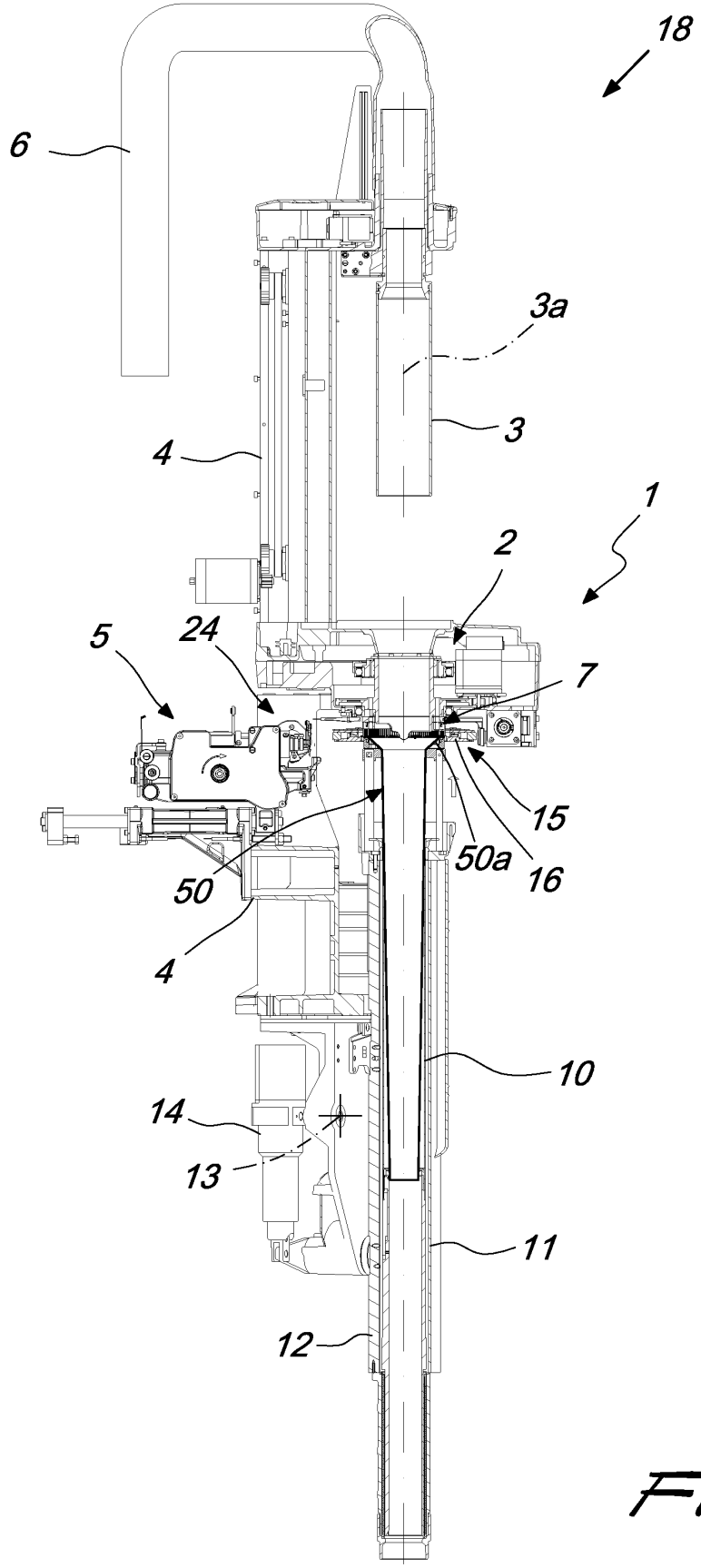


Fig. 3

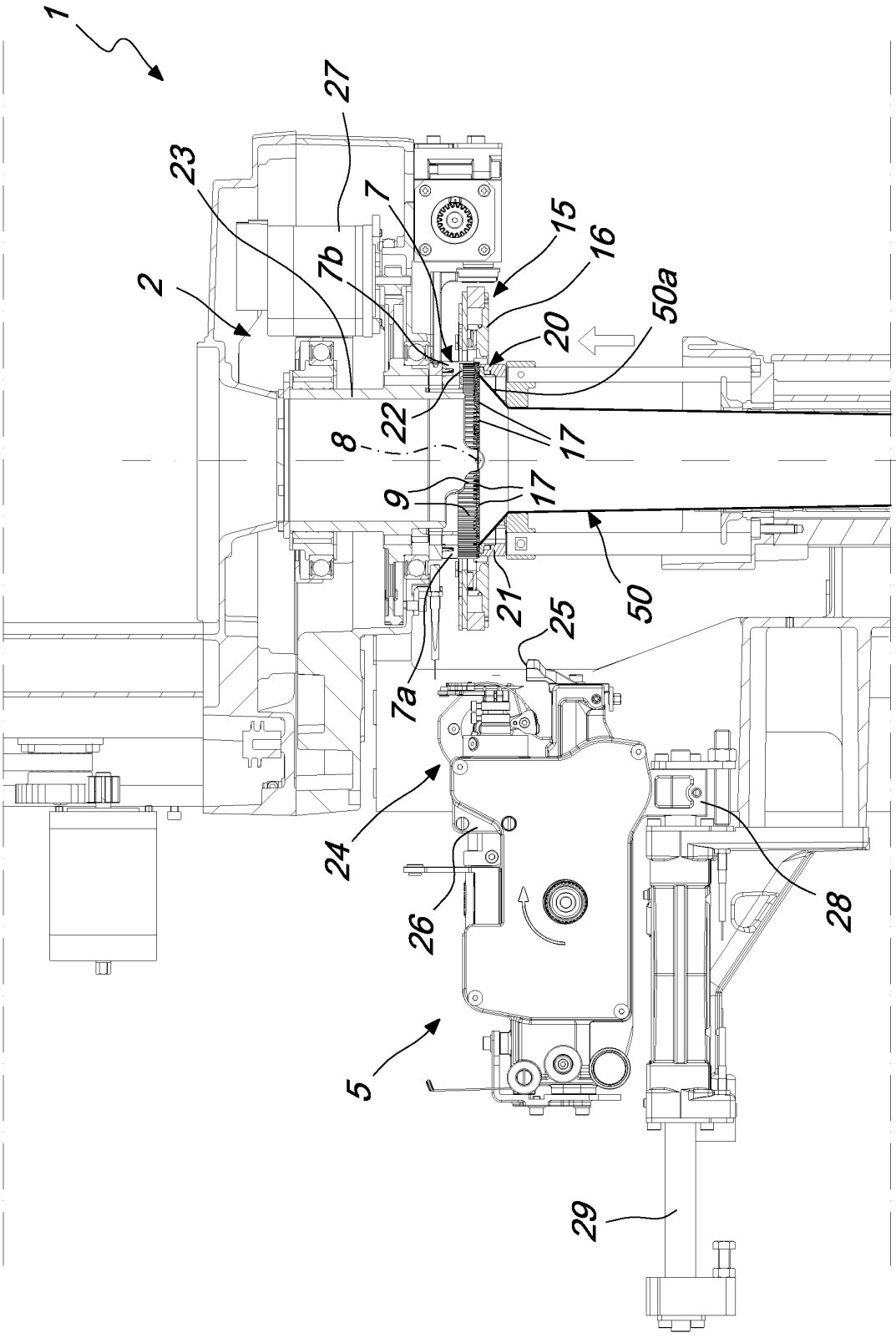


Fig. 3a

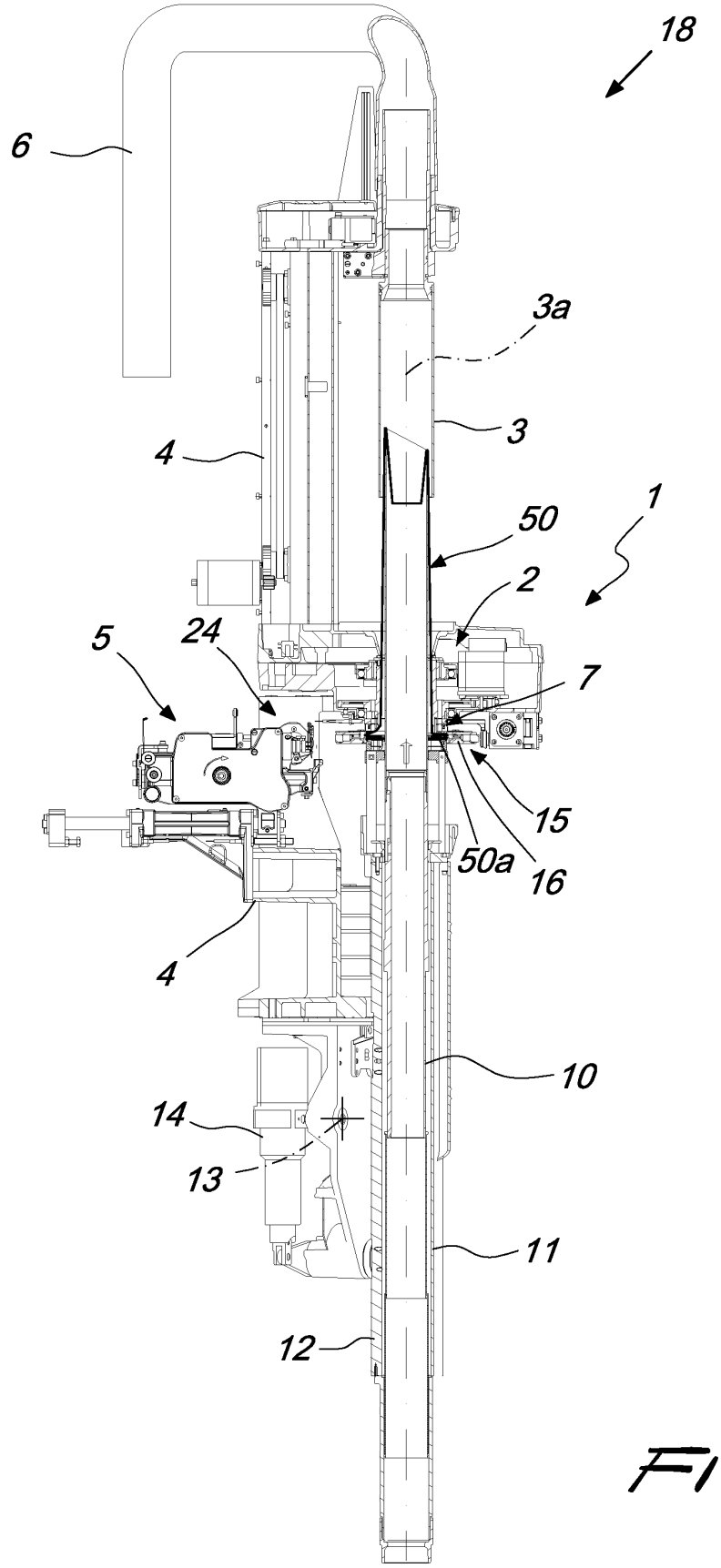


Fig. 4

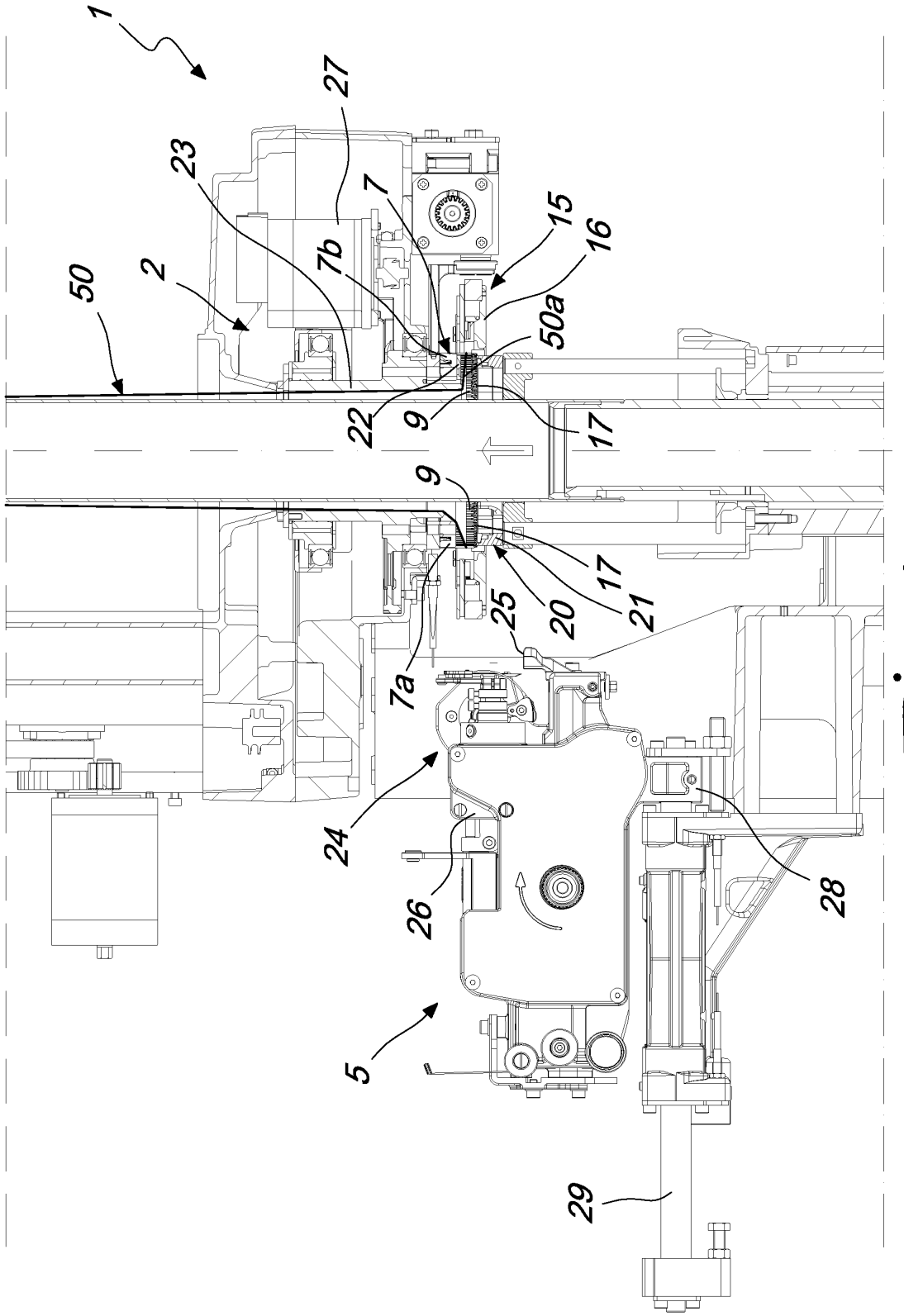


Fig. 4a

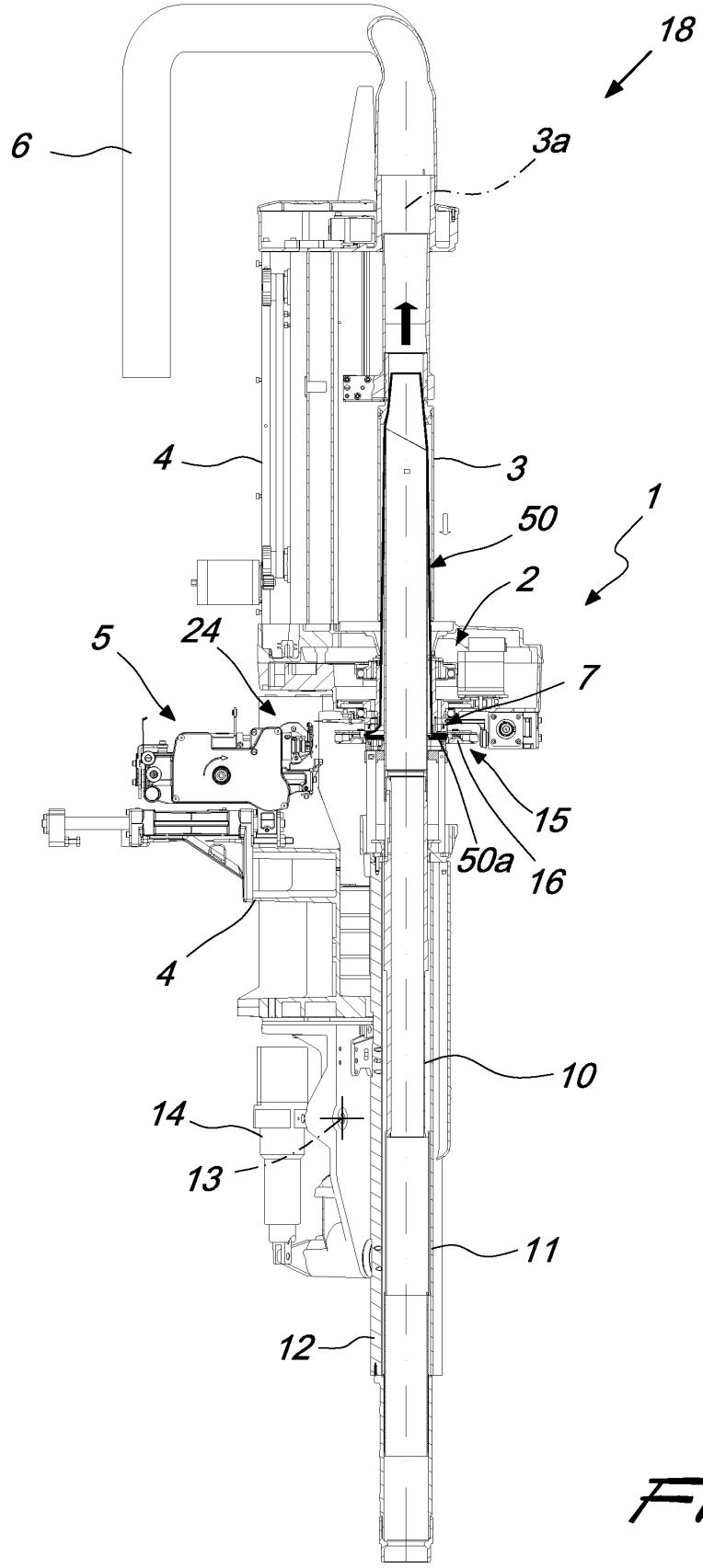


Fig. 5

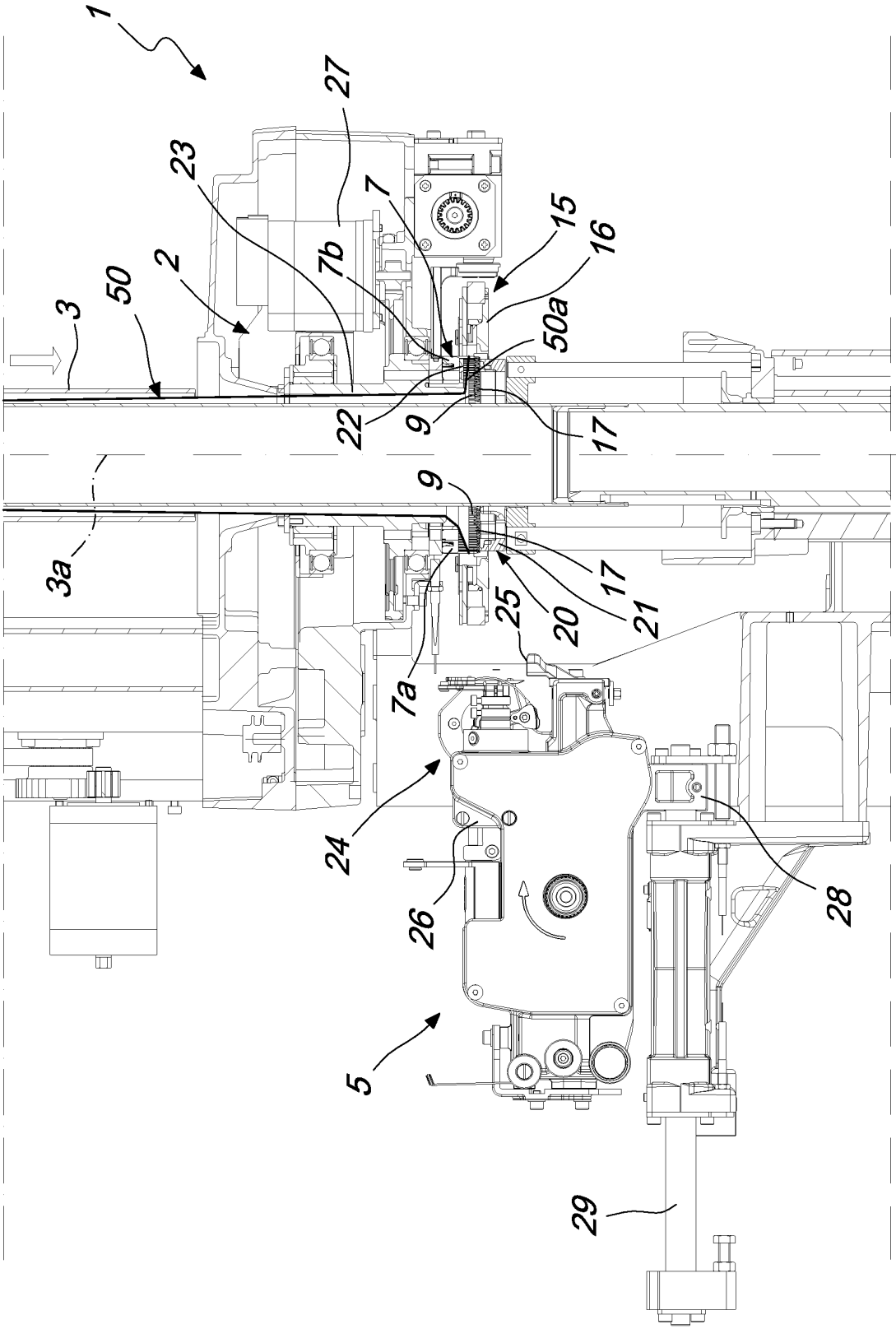


Fig. 5a

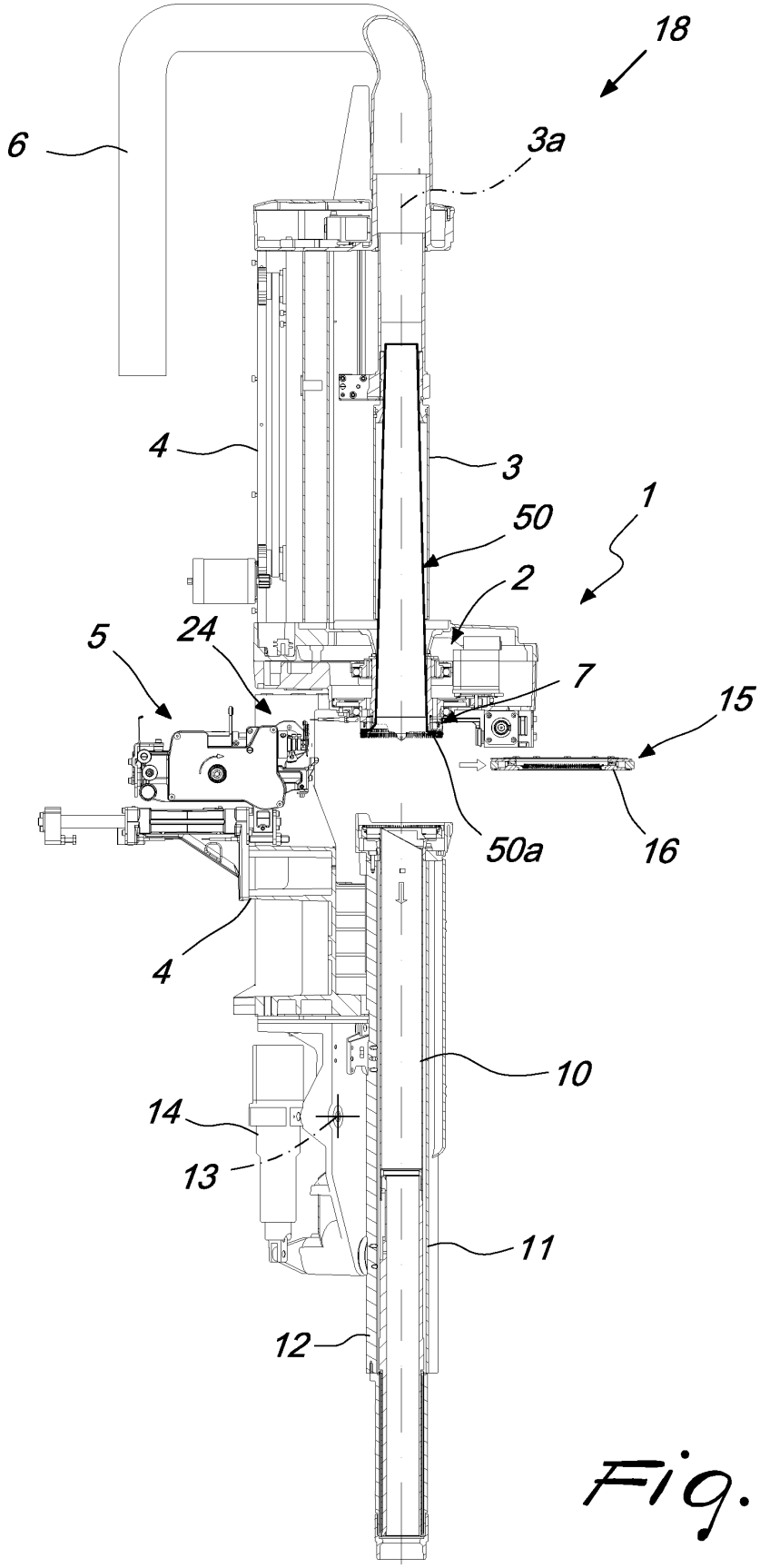


Fig. 6

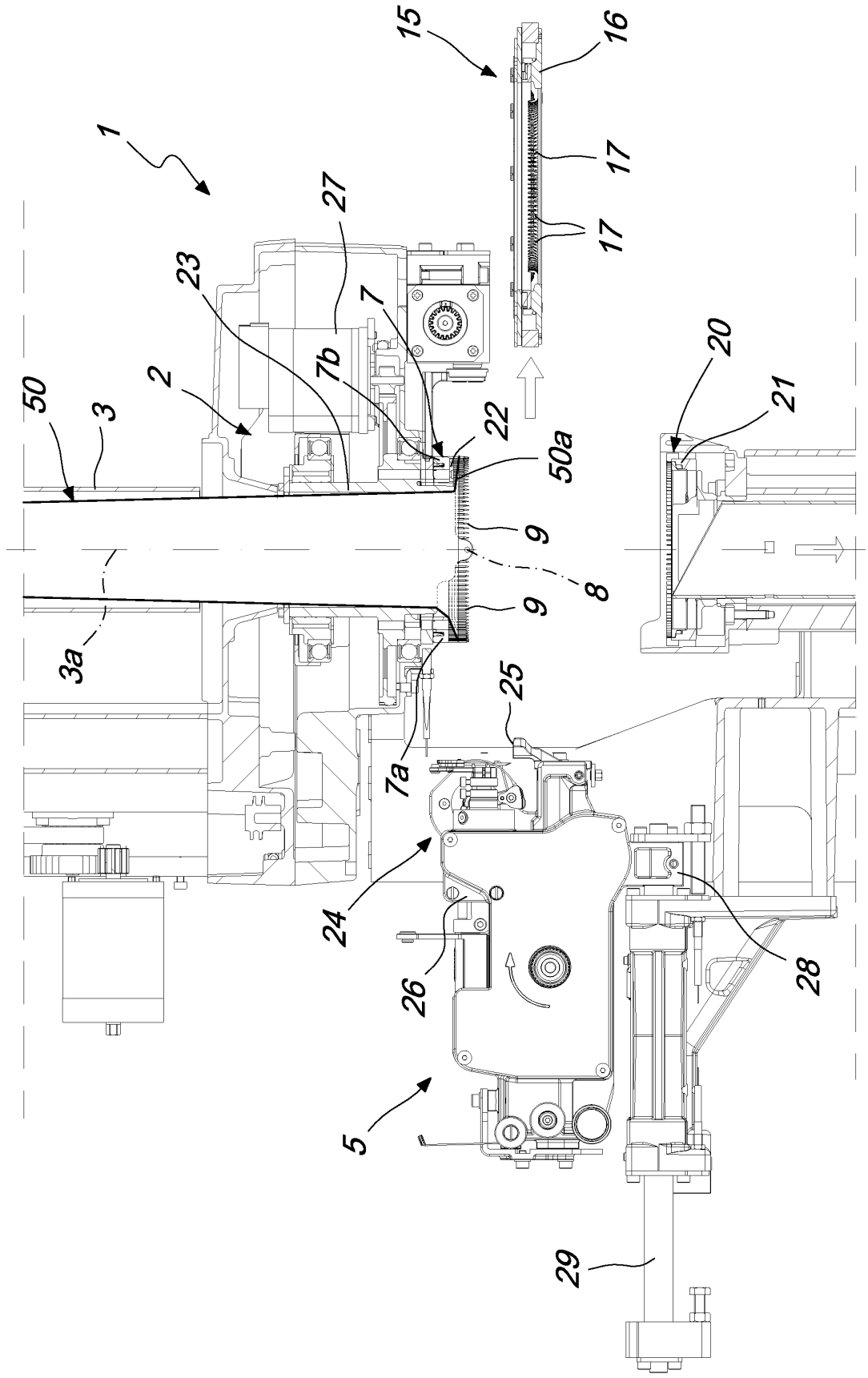


Fig. 6a

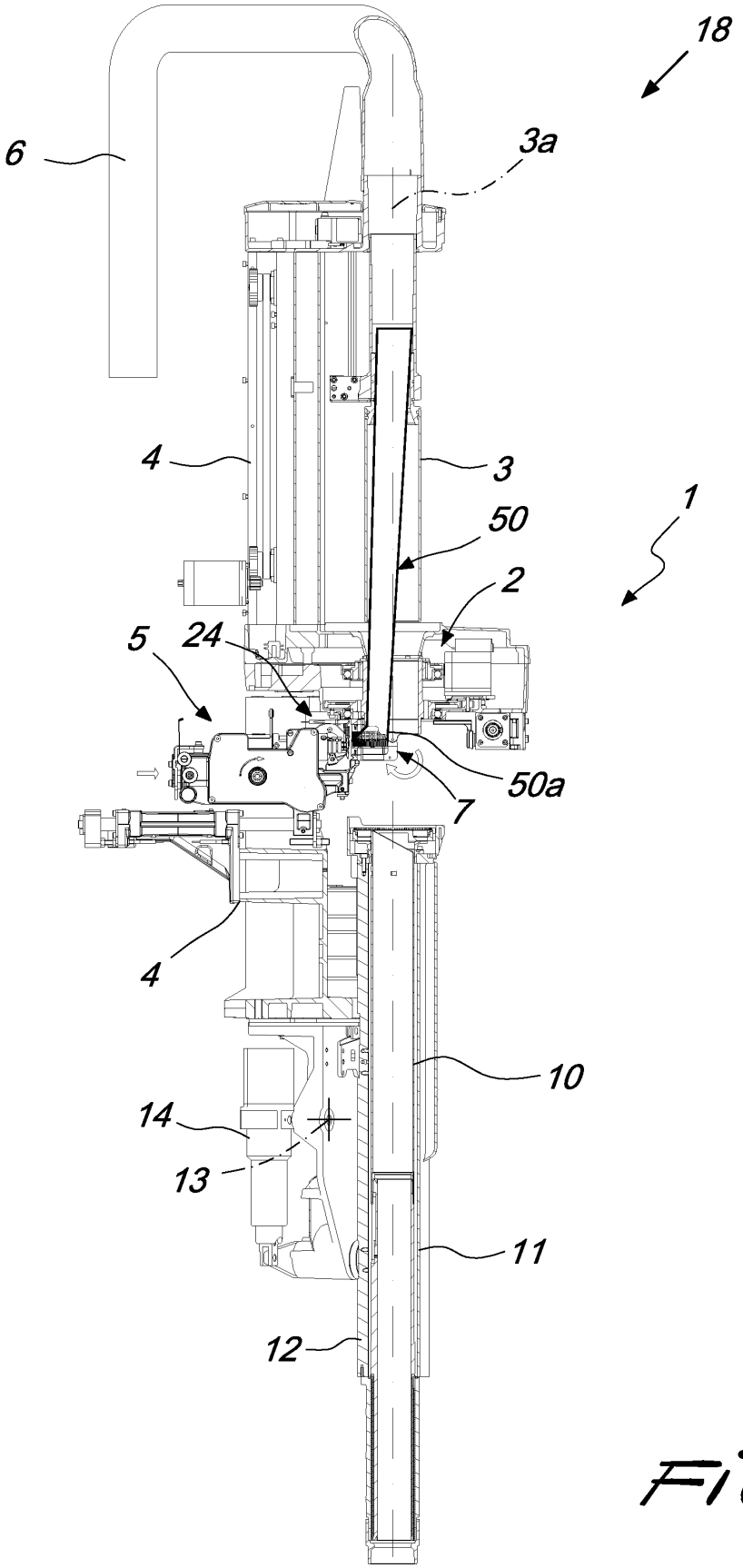


Fig. 7

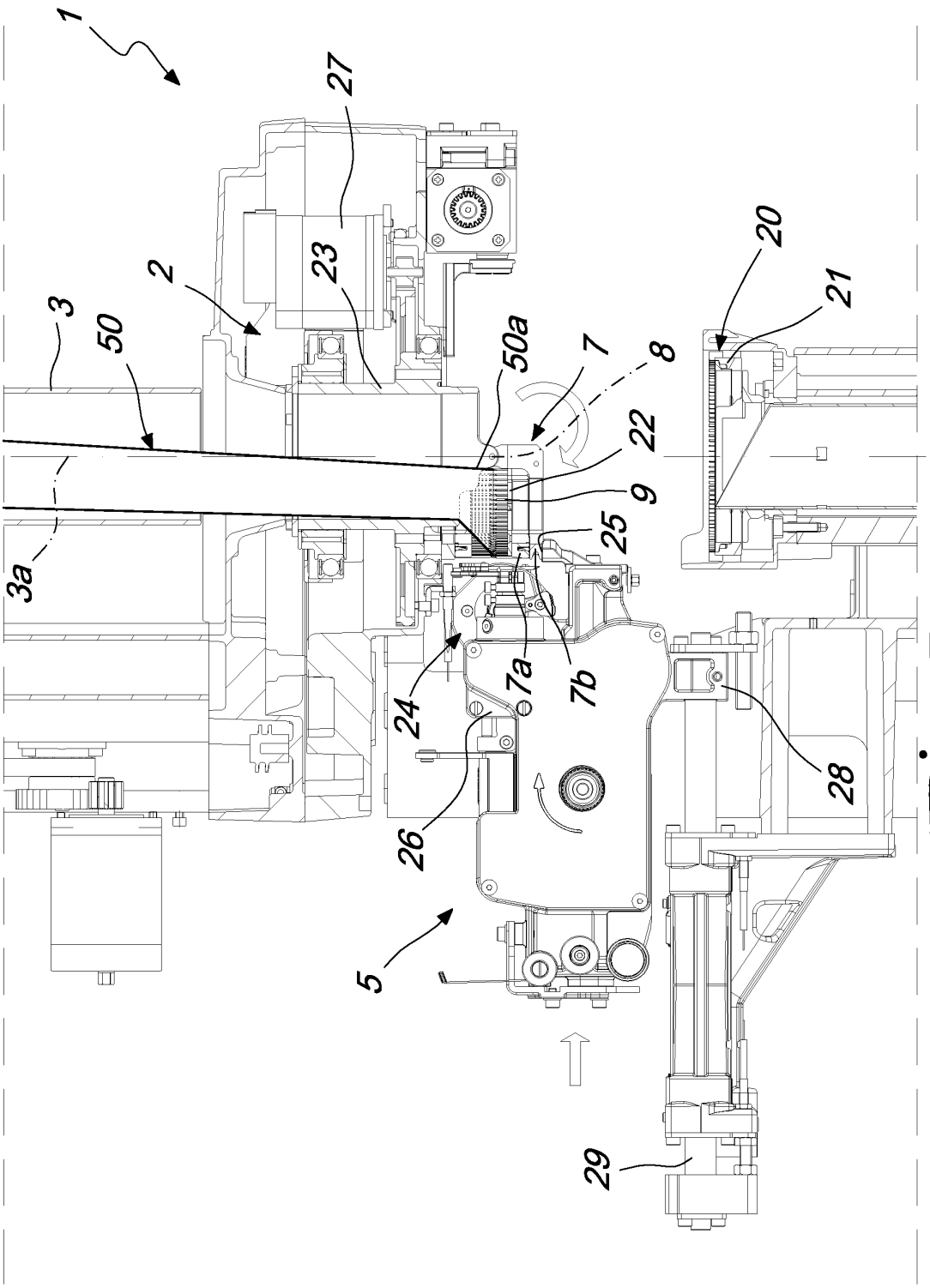


Fig. 7a

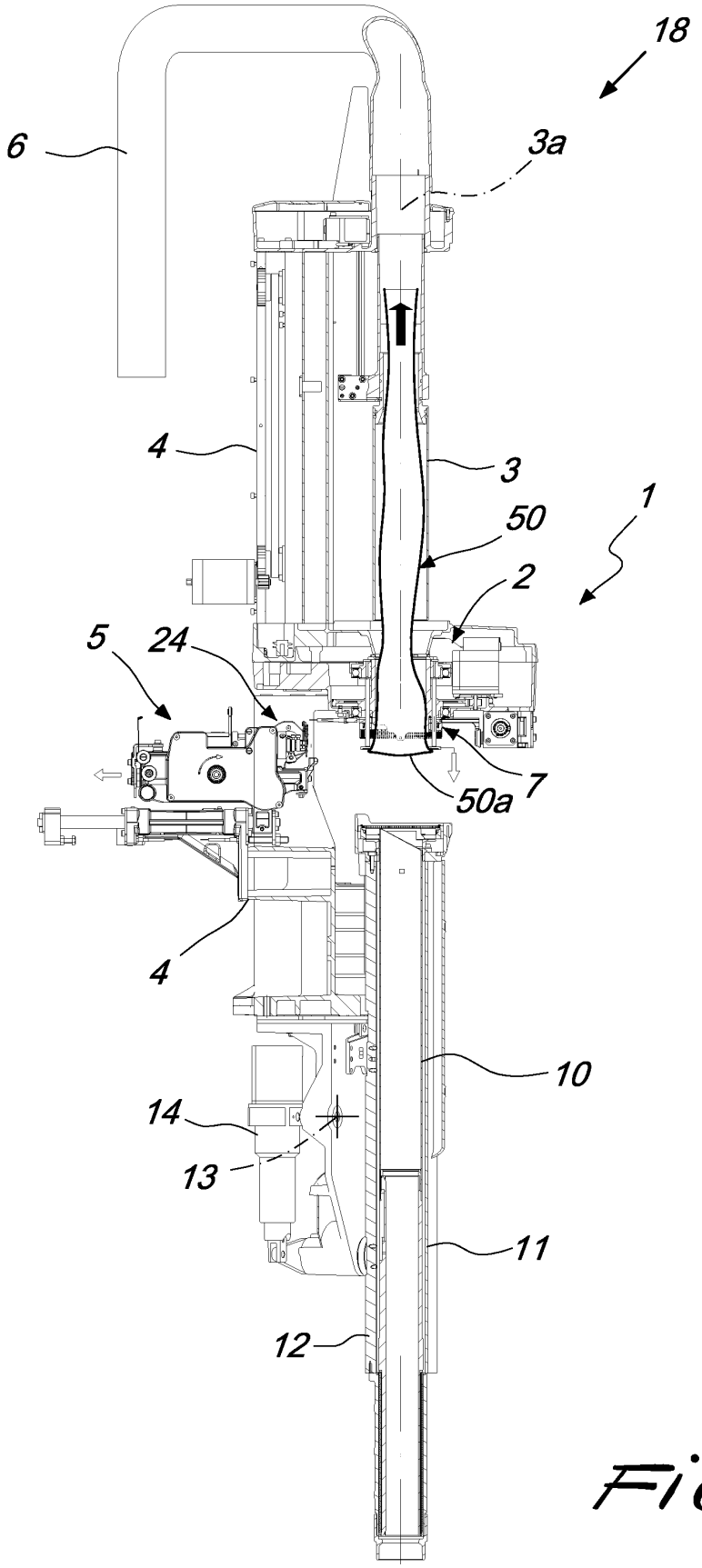


Fig. 8

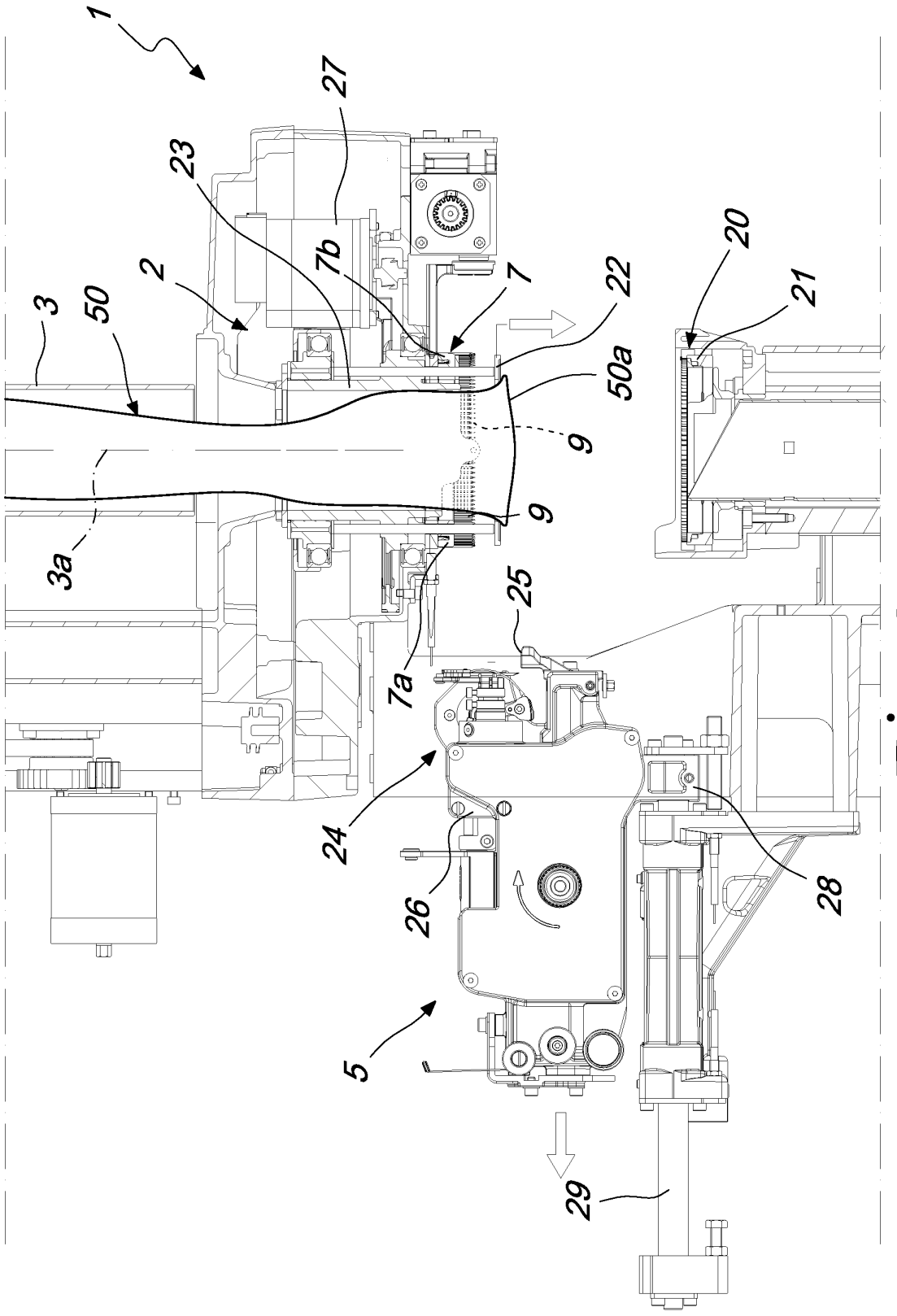


Fig. 8a

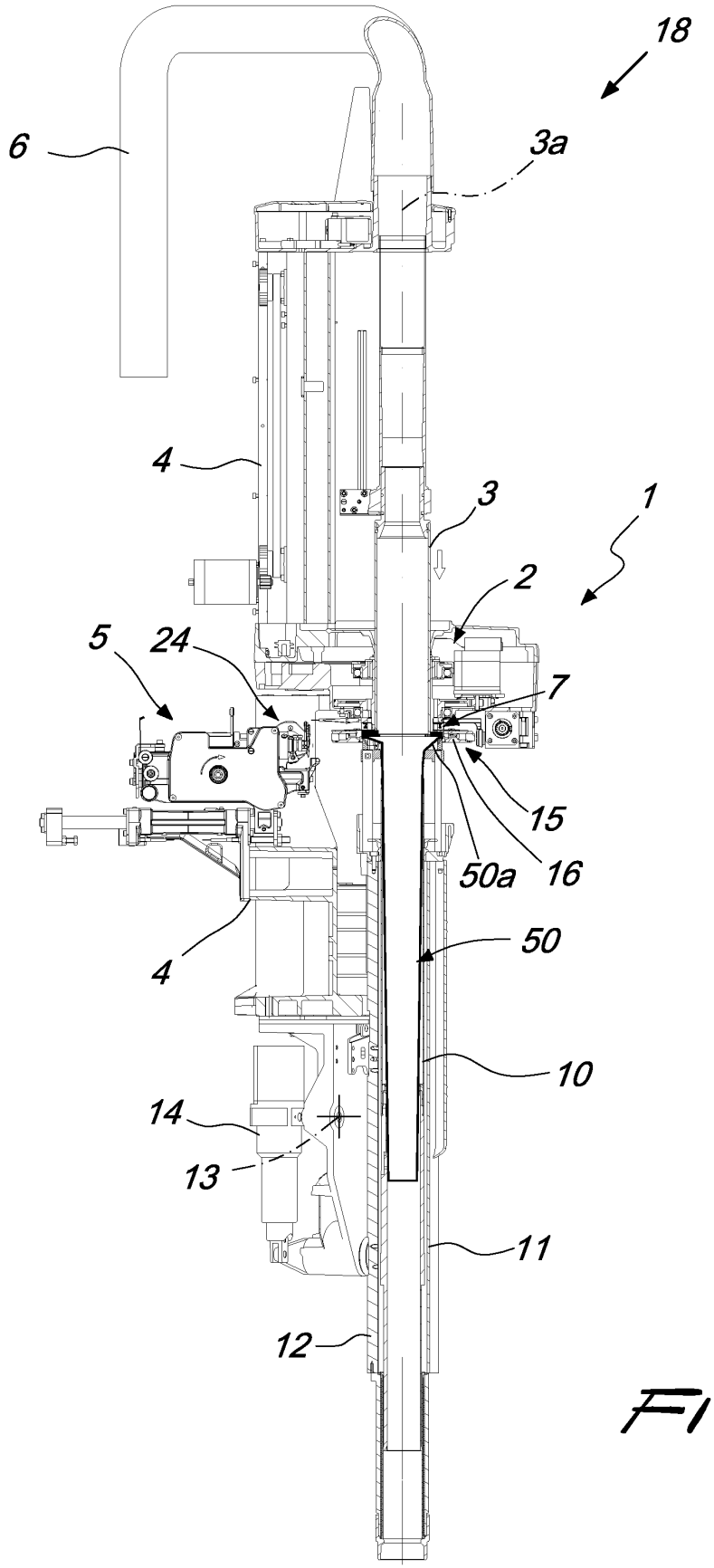


Fig. 9

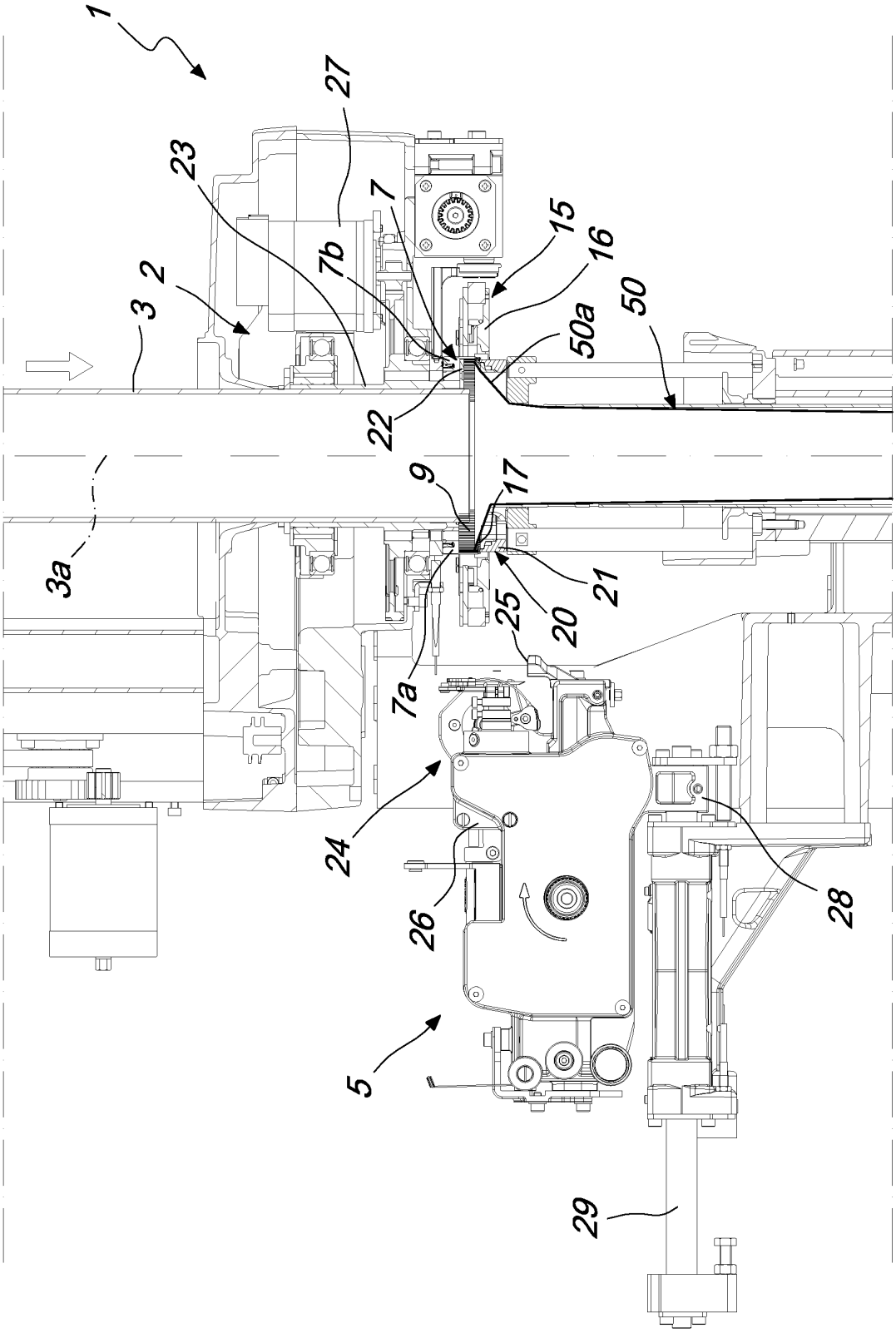


Fig. 9a

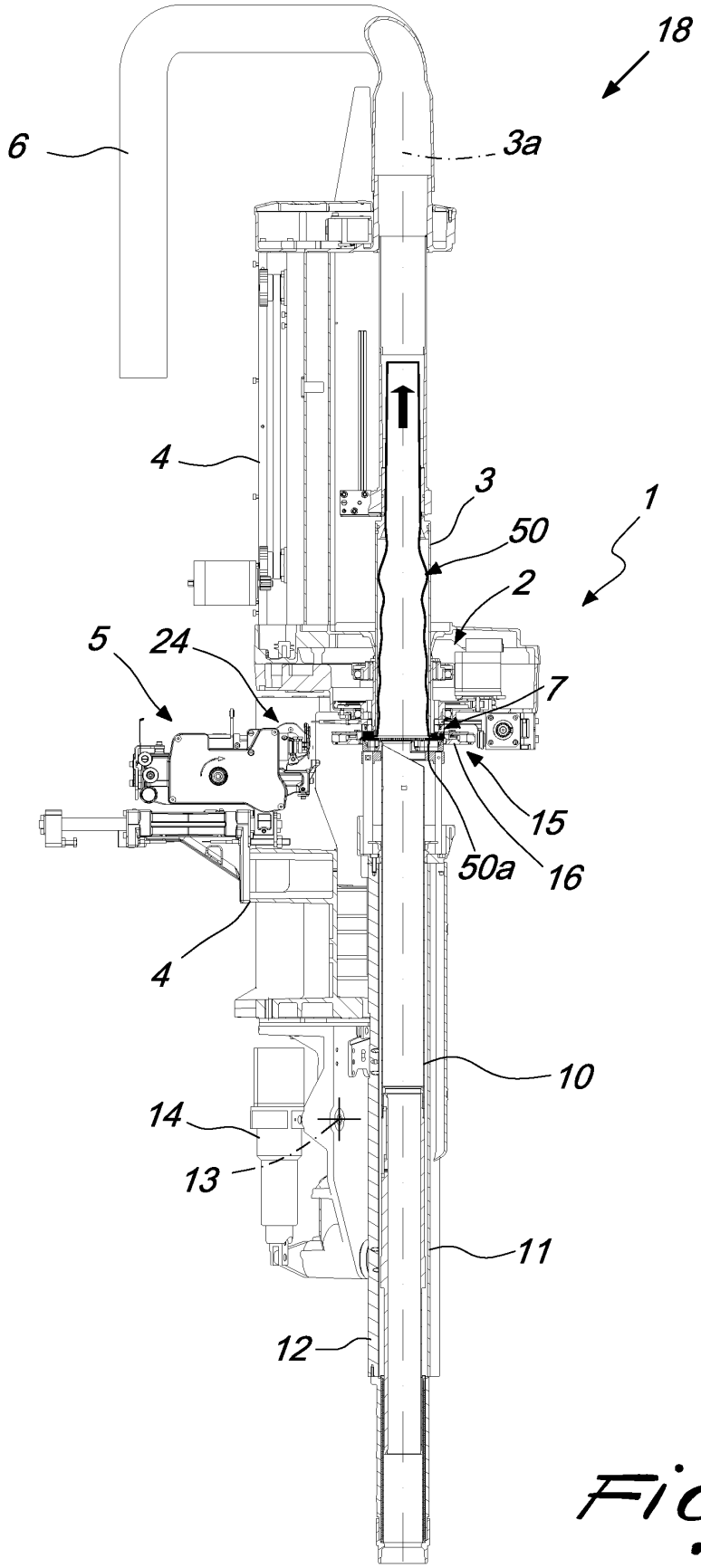


Fig. 10

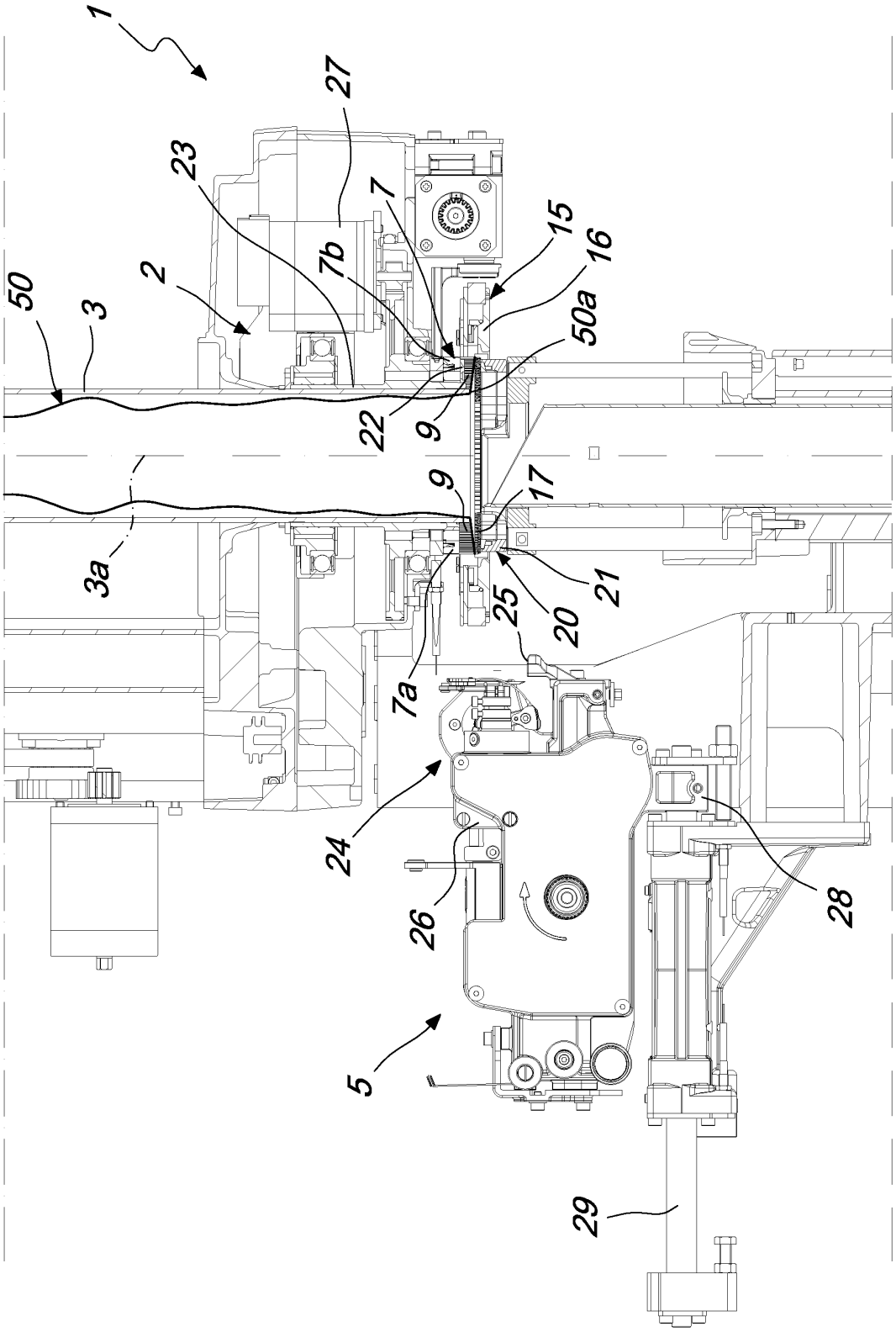


Fig. 10a

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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